



CANNABIS CULTIVATION
A COMPLETE GROWER'S GUIDE

by JAMES HAMILTON

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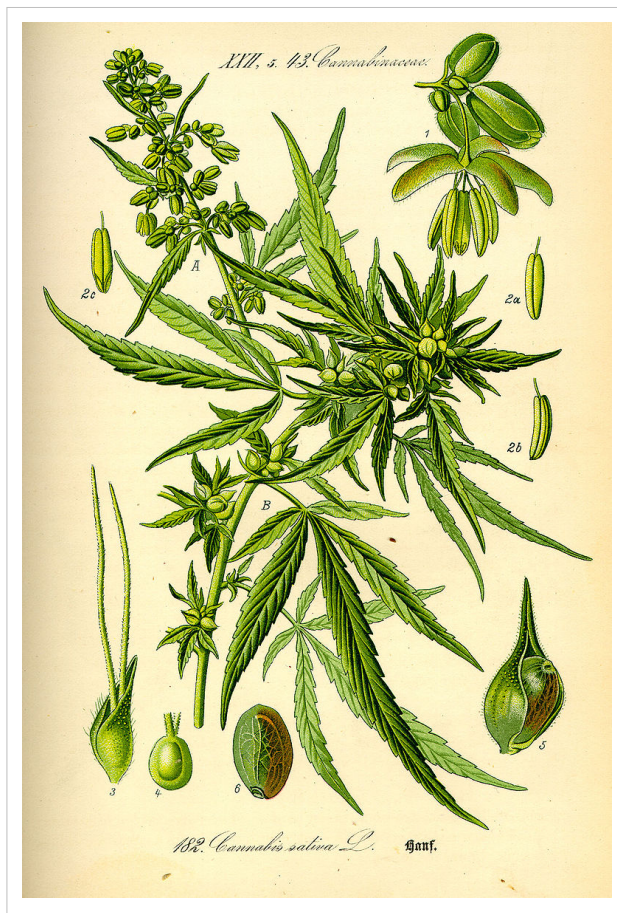
Marijuana Cultivation

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→ Introduction

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Nothing contained in this book should be construed to be legal or medical advice.

References

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Marijuana Cultivation/Introduction

Marijuana Cultivation

Purpose

This book is to provide instruction on the use and cultivation of marijuana, also known as cannabis or hemp. In this book you will find all the information needed to go from seed to a fully functioning garden.

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How to Use

This book is not designed to read straight through. Information is organized by topic, although you can certainly read everything through you can also jump right to the topic you are interested in.

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Fundamentals

Marijuana Cultivation/ Fundamentals/Of Myths and Magic

Of Myths and Magic

There is certainly as much myth and folklore spreading around about marijuana usage and cultivation as anything else. This book attempts to slash through those myths to actual proven and utilized techniques that have been put into practice. It is highly recommended that you consider the tested information in this book as a primary source of information and doubt conflicting third party information until it is proven to you.

Some common myths that are seen include the use of menstrual blood for flowering. The claim that baking soda and vinegar will kill plants if used to adjust PH. Some people claim that absolutely any light level whatsoever will destroy crops and others claim that a couple hours of light in the middle of the dark cycle will improve the size of flowers. If you want to know the truth about these claims just dive on in ahead. Everything you need to grow high quality, potent, and high yielding marijuana plants is contained in these pages.

Marijuana Cultivation/ Fundamentals/Parts of the Plant

Parts of the Plant

This section is added for the curious who don't know much about marijuana and how it is used. The entire plant contains the psychoactive ingredients which include Delta-9 THC and many cannabinoids that give each plant its own unique profile of properties and effects. However, not all parts contain them in the same concentrations.

Flowers

The flowers or Buds of the plant contain the highest concentrations of plant resin which in turn contains the highest concentration of active ingredients. The unpollinated flowers of the female plants are the part of the plant that is used by recreational users because they produce copious amounts of potent plant resin in order to try to catch pollen. Marijuana is one of the few plants today that actually is split by gender and has distinct separate male and female plants. Female plants do not pollinate themselves in the absence of males but do contain the genetic capability to produce male flowers and may do so under stress. There are also hermaphrodite plants that produce both male and female flowers. Male plants and male flowers are not very potent and are not used recreationally

Leaves

Leaves are generally **not** used recreationally and will generally give you a headache rather than get you high. There are however ways to extract the active ingredients from leaves and the different types of leaves have different potencies.

Large Shade Leaves

These are the large classically shaped leaves on the plant and are the least potent. There are extraction methods that can be performed to get something useful out of these but the result won't be very pure and many growers just throw them away.

Grow Tips

These clusters of small tender leaves are the point on the plant where new growth sprouts from during vegetation. They are more potent than Shade leaves but less potent than trim leaves or bud.

Trim Leaves

These are the sugar coated leaves that are trimmed from around the buds during harvest. The sugar coating of trichomes can make these quite potent and they can be as potent as low quality flowers with seeds.

Stems

The stems are not really useful for psychoactive purposes but they are a great source of plant fiber for rope, paper, etc.

Seeds

The seeds generally contain only trace amounts of psychoactive ingredients but they are one of the most nutritious foods currently known to man. They are one of only a handful of substances that man can sustain off indefinitely with no other food and provide all known amino acids.

Trichomes

Trichomes are the oil glands of the plant and contain the highest concentration of active ingredients of any part of the plant. The flowers are sought out because they contain the highest concentration of trichome and hash is made from collected and pressed trichomes. These are very useful for determining the maturity of a plant during the flowering stage.

Roots

The purpose of the roots is served when the plant is harvested. They have no useful psychoactive ingredients and aren't typically eaten.

Marijuana Cultivation/ Fundamentals/Inside vs Outside

Inside vs Outside

This is probably the single biggest divider of growers that there is. Do you grow outdoors under the big bright sun or indoors in a room or closet? There are definitely pros and cons to either method.

Outdoor

The benefits of an outdoor grow are obvious, you don't need to worry about ventilation or light. The sun provides 2000 watts per square foot of bright light and that is certainly more than any indoor grower is likely to have at his disposal any time soon. Make no mistake that light difference is important! The air is fresh and plentiful and will deliver all the CO₂ that your plants will ever need. Organic nutrients can be found in the soil and if they can't in your location you can always prep your soil. Finally the roots of your plants will be able to spread far and wide. There are also downsides to be considered. You have no control over light cycles and must grow on the natural annual harvest cycle, you have absolutely no privacy and some areas require you to take privacy precautions in order to grow for medical use. Outdoors you have open ventilation which means your plants could be pollinated by wild pollen messing up your attempts to breed seed of a certain strain or avoid seed. You are also mostly limited to soil grows outdoors unless you have a greenhouse which is sort of a hybrid of indoor and outdoor growing.

Indoor

The benefits of an indoor grow are not necessarily immediately realized. It is obvious that an indoor grow affords more privacy but the biggest benefit of an indoor grow is control. You can control what type of light is provided, how often its provided and the hours. You can control the temperature and humidity of your grow environment to make them optimal for the plant. You can easily switch between hydroponic and organic growing. Indoors you will have a smaller harvest (plants simply aren't going to grow as large without a light as large as the sun) but you will be able to use lights to have plants in varied stages of growth at all times so you can harvest more plants more often. Indoors you might be able to harvest every two months in an established garden or even more often in a larger grow.

Marijuana Cultivation/ Fundamentals/Dirt vs Hydroponic

Dirt vs Hydroponic

This selection is very fundamental to how you will grow from here on in. That said, it is possible for a skilled grower to achieve similar results using either method. The myths surrounding this choice are many. There are those who claim that hydroponic (or hydro) bud has a bad, chemically, metallic taste or that soil grown marijuana isn't potent. Although there is plenty of bad tasting hydro and weak soil grown marijuana these differences are caused by poor practices elsewhere in the growing process and not whether soil or hydro is used as the growing method. For instance, hydro growers are often commercial growers who are trying to output as much marijuana in as short a time as possible. These growers do not take the time to purge and cure their plants at the end of the flowering cycle and after harvest. This causes the bad taste. It is entirely possible to make this same error with a soil grow.

Dirt

Dirt carries a number of benefits and pitfalls. Dirt is easy to acquire and easy to maintain it is literally all over the ground. Dirt allows you to mix your nutrients into the potting soil rather than having to carefully mix up nutrient solution with each watering. Dirt retains moisture for a period of days so if you go on vacation no special steps will be needed. For those that don't science, if there are things a plant needs that science doesn't know about then dirt will certainly have them. Dirt buffers the roots of a plant from nutrients and PH fluctuations. This is both good and bad. When you add nutrients they are delivered slowly and it may take longer before the effects of doing this become apparent. It is very easy to over water in a soil grow. This is a common beginner mistake. You should always allow the soil to dry completely to the touch before watering again. This is needed to allow oxygen to get to the roots.

The ideal PH for soil grows is 6.5 and can be taken by measuring the runoff when you water. The best way to maintain the PH on a soil grow is to maintain the PH of the water you are using. This range allows the uptake of manganese. The utility of this nutrient in plant growth is debated but what is not debated is that manganese is not available to the plant at the ideal hydro PH.

If a PH or nutrient imbalance occurs in a soil grow it may be corrected by flushing with lots of water, in a pot it should be at least three times the capacity of the pot. Outdoors in the ground you should flush with water thoroughly with a hose or bucket.

Hydroponic

Hydroponic systems range from very simple to very complex. Essentially the only thing that differentiates a hydro system from a dirt grow is that in a hydroponic system a solution of nutrients and water delivers all nutrients to the plant and the physical medium that the plant grows in is inert with no nutrient content. The advantage of hydroponic methods is that they provide more rapid nutrient availability to the plant. This allows the plant to drink as much nutrient as it likes and produces larger plants in a shorter period of time and smaller space. Popular methods include:

Ebb and Flow

An ebb and flow system uses a timer to activate a pump that periodically floods the plants grow medium with nutrient solution and then drains the solution out.

Often these system are designed using two plastic tubs, one sitting in another. The bottom tub contains the nutrient solution reservoir, the water pump, and an air stone (more oxygen means healthier roots) and the top tub or tray contains the plants. A single hole in the top tub allows the pump tubing into the tub, when the pump shuts off or in the event of a pump failure the water drains right back down the hole it came out of. It is usually best to put another hole where it will drain down to the bottom tub at the highest level you want the water to reach. This prevents flooding. A system like this can run at different intervals depending on the grow medium you use but a common choice is 15min on and off cycles, or 30 minute on and off cycles.

Be very careful with a system like this. If a pump failure is not detected plants can die in a very short time period.

PH and Nutrient problems can be corrected in the reservoir with the need to fiddle with the plants themselves.

Deep Water Culture

Deep water culture is a very popular technique where one bucket is fit into another. In the bottom bucket is placed an airstone (limewood or porous stone) and in the top bucket holes will be drilled to allow nutrient solution to flood the bucket to a certain level. The airstone provides oxygen to prevent the roots from rotting even though they are submerged. This is a very simple system to build but requires a pot for each plant.

Correcting PH and nutrient problems is a matter of changing the solution and rinsing the plant medium with clean water.

Nutrient Film Technique (NFT)

Nutrient film technique involves plants potted so their roots dangle down into a thin film of constantly running nutrient solution. This technique can work well for large scale hydroponic growing operations but if the nutrient film is interrupted it can be devastating. A separate reservoir is maintained in this technique and it is not commonly used in practice.

Aeroponic

Aeroponics is a relatively new technique. Like in NFT plants are suspended over the nutrient but instead of a film of moving nutrient there are instead air stones spread under the roots in the nutrient that highly oxygenate it and produce bubbles. The bubbles burst and splash the roots with nutrient that is as oxygenated as possible. This can stimulate very impressive root growth. In practice aeroponics aren't considered especially effective for large plant growth though there is no theoretical reason they could not be. This type of system is very often used for maintaining small clones.

Wick/Hempy Bucket

Wick systems and Hempy buckets are very similar. In a wick system a pot with medium has a wick placed down it that extends down into a reservoir and draws up nutrients via capillary action as they are needed or water evaporates. This is much like the way a lantern or wick lighter works, drawing flammable fluid up the wick to be burned until it is exhausted.

The hempy bucket is named after the forum poster who claims to have developed it although the concept may date back further. A simple 2.5 to 5 gallon bucket has a 3/4 inch hole drilled about 2-2.5 inches above the bottom. Depending on the medium and size of the medium used it may not be needed but it is common to glue a piece of plastic screening over the hole on the inside of the bucket. This bucket is then filled with a mixture of perlite and vermiculite (popular mixes are 3 parts perlite to 1 part vermiculite and 1 part vermiculite to 1 part perlite).

The bucket is then watered with full strength nutrient solution every 3-4 days, you water until nutrient comes out the hole in the bottom. This flushes out any built up nutrient salts with every watering assuring that you have a perfect balance.

A hempy is as simple as hydroponics gets and is capable of producing the same yields and quality output as other more complex hydroponic systems. Because it allowed to mostly dry between waterings and pulls nutrients up via perlite wicking the roots are very well oxygenated. Since fresh nutrient is added every 3-4 days there is no reservoir to become imbalanced. Although it looks like dirt the perlite/vermiculite medium is completely inert, it contains no nutrients and provides no PH or nutrient buffer. Plants can drink all the nutrient they want just as in other hydroponic systems.

The hempy system has the advantage that because it is simple there are fewer mistakes to be made. Also important is the fact that the hempy bucket has no pumps of any kind that can fail without you noticing. Hempy buckets can be used in a greenhouse outdoors with no power at all. Like a soil grow the medium retains moisture so you can leave the bucket for up to a week with no adverse affects.

The downfalls compared with other hydroponic systems are that plants must be moved one by one in buckets if moved. You also must water a hempy bucket by hand every 3-4 days and with a large number of plants that can become very labor intensive. For instance, for someone who could not carry a five gallon bucket filled with water a hempy installation of more than 3-4 plants would probably be unmanageable unless the water source was very close by. Because you flush out the nutrient solution and any unused nutrients in it every few days the hemp bucket also requires more nutrients than other hydroponic methods.

Continuous Drip System

Another popular technique is the continuous drip system. With a continuous drip a reservoir (often large outdoor garbage cans) are used with a pump to push nutrient through a hose. The hose will have holes or drip fittings over each place that should be watered and maintain a constant slow drip or trickle into the container.

Consideration and Pitfalls

It is important with any hydroponic system to remember that there is no buffer. Plants will respond very quickly if there are no nutrients and/or water or the PH of the nutrient solution is incorrect. Roots need high oxygen levels or they will rot. And of course remember that plants need space to grow and should never be planted where their roots will intermingle.

Ideal PH level with hydroponic systems is 5.8. The best way to handle a PH adjustment depends on whether you are using a reservoir or not. In a hempy bucket the best solution is to flood with nutrient that is corrected. This will push out the imbalanced nutrient. With a reservoir PH can be adjusted in the same manner as the water with a PH up and PH down solution.

Marijuana Cultivation/ Fundamentals/Organic vs Inorganic

Organic vs Inorganic

The organic vs inorganic choice is a hot topic. You don't need a book to help you make any moral decisions so its just the facts here. The plant material that the plant grows is identical in structure and content regardless of which method you use. The plant only uses basic building blocks, taking molecules from the air and the nutrients and assembling them into the plant matter. The by product of this process is oxygen.

The real (practical) difference between organic and inorganic growing is how the raw materials are provided. An organic grower will use larger elements that will be broken down by a system of organisms living in the nutrient solution/grow medium or the soil. An inorganic grower uses nutrients that are already broken down into a form that the plant can utilize. Non-organic nutrients might contain organic components. For instance, many fertilizers intended for soil will include urea nitrogen. This nitrogen requires micro-organisms to break it down before the plant can use it. These organisms won't thrive without soil so these fertilizers may not work in hydroponic systems.

There are hydroponic mixtures that are organic and there are those which are not. Either way, you have control over what you feed your plants and can insure that no harmful pesticides or other chemicals are used in growing your own marijuana. Provided you flush your plants properly they won't contain any of the nutrient solution so the actual plant material that results should be the same.

Marijuana Cultivation/ Fundamentals/Nutrient Selection and Maintenance

Nutrient Selection and Maintenance

Nutrient selection is a very important part of your growth plan. This book will not advocate any specific nutrient blend or mix but instead will cover nutrients in a more general manner.

There are three macro nutrients that must be considered when growing marijuana, (N) Nitrogen, (P) Phosphorus, and (K) Potassium. Almost every plant additive you look at will specify these numbers often in the format N-P-K without actually labeling which is which. These numbers really don't let you compare competing products effectively but they do show you the ratios of one macro ingredient to the next. During the different growth phases you will want different concentrations of these macro nutrients. During vegetative growth you will want high nitrogen and low phosphorus and during flowering you will want high phosphorus and lower nitrogen. It is worth busting another myth here. Many people believe that because there are separate vegetative and flowering formulas that having high P during veg or high N during flowering will hurt things. This simply isn't true. It is wasteful to throw away chemicals that are not needed and there is a maximum nutrient concentration that plants can handle without burning roots. This means that you wouldn't want to trade P for N during flowering. But most flowering formulas actually contain enough N that they could be used during vegetative growth.

There are also a number of micro-nutrients needed for growth that must be present. Many major fertilizers for soil do not contain these micro-nutrients because they assume it will be provided in the soil. Always use hydroponic nutrients for hydroponic growing.

Regardless of what nutrients you use, they will be mixed with water. The water you use should ideally be reverse osmosis treated or if tap water is a must then make sure to let it sit out overnight to let any chlorine contained in it evaporate. This is a deceptive thing in that chlorinated tap water will work fine but will prevent your plant from ever reaching its full potential. This is a great place to squash the rain water myth. Rain water is full of minerals, dirt, and living organisms it is neither the best nor the worst choice for growing plants. In particular if you are using an indoor grow or hydroponic rig you will not desire to use rainwater since it will contain heavy amounts of minerals that you did not intend to add to your carefully controlled growth system.

Dry vs Wet

Wet nutrients are very trendy and hip in the hydroponic world. There is nothing wrong with a wet nutrient, you know it will mix well but they are generally more expensive because the bottle contains more water and less nutrient. This also makes them more expensive to ship and transport. When it comes time to mix them and feed your plant either dry or wet works equally well.

In both cases you should add to the water after filling the container rather than adding nutrients and then filling. Adding before filling can lead to nutrient imbalances.

Flushing Soil

Nutrient salts will build up in soil it is highly recommended that you flush your soil plants with clean water from time to time. If in a pot flush with 3 times the volume of the pot with water and for plants in the ground flush until the ground is fully saturated and possibly repeat the following day. This is also recommended if the plants show signs of nutrient or pH imbalance.

Maintaining a Reservoir

Proper maintenance of your reservoir is essential to growing healthy marijuana to its full potential if you grow using a hydroponic method that requires you to keep a res. The critical factors here are nutrient levels and PH. Unfortunately, there is no simple way to track the level of individual nutrients in your reservoir but there are ways to keep a healthy reservoir system going just the same.

To begin, you will want to mix your nutrients at full strength according to the manufacturers recommendations. You should use either reverse osmosis treated water or if you must use tap water draw it from the cold water tap and let your water sit overnight to evaporate chlorine. Hot water will contain more dissolved impurities than cold water. After adding your nutrients and micro-nutrients you should adjust your PH to 5.8 which is ideal for hydroponic nutrient solution. Measure the TDS, or total dissolved solids with a TDS meter. With full strength nutrient solution this number will probably be around 1100-1300 TDS. This will be where you want to keep your nutrient (if using lower strength nutrient for earlier stages then mix and measure TDS accordingly).

Now all you need to do is top off your nutrient solution with clean water daily. If your TDS is low then add nutrients. If your PH is off then adjust it.

Since the plant will not absorb nutrients in the same proportions you are adding them imbalances will result over time. To correct this you will periodically need to drain and fill your reservoir with fresh nutrient solution. To begin with do this at least once a month and just before you start flowering. During flowering change the reservoir every two weeks. How often you actually need to do this depends on the plants, the nutrients, the size of the reservoir, etc. Luckily the plants will let you know how often you need to do this. They will start exhibiting signs of nutrient deficiency when there is an imbalance and you will know that you can't go longer than that before changing the reservoir. Especially with clones you will be able to get res changes down to a system of clockwork since the clones will generally all have the same nutrient preferences.

PH Ideals and Adjustment

The ideal PH for your garden is based on nutrient uptake. A PH that is too low will be too acidic and burn the roots of your plant. A PH that is too high will be too alkaline and cause your plants roots to be unable to uptake nutrients. Many supposed nutrient deficiency problems are really caused by improper PH levels. PH can be tested with a digital meter (ideal), or with chemical drop tests or test strips. Because PH optimally should be adjusted to a tenth of a point accuracy a digital meter is highly recommended.

Depending on your method of grow and weather you are using soil or hydroponic different nutrients will be absorbed at different PH levels. For a hydroponic garden the only PH level that all nutrients will be absorbed at is 5.8. For soil gardens the ideal PH is 6.5.

Adjusting PH

Leaving tap water to sit out overnight will evaporate chlorine and raise PH. Adding nutrients will lower PH. But once you have done those things how do you move the PH to where it needs to be?

There are a couple simple ways to do this. There are commonly sold chemicals known as PH up and PH down sold at hydroponic gardening stores that will adjust PH for you. Similar chemicals are also sold for pools but these are not recommended for plants. But the easiest method can be found in your kitchen. Simple baking soda and distilled white vinegar will adjust PH up and down respectively. These should be used in very small amounts. You might need to play with them to find what is needed for your water source and nutrients (it should remain consistent once you've found what you need to add). I find that in a 4 gallon flowering nutrient mix 1/2 tsp is enough to raise the PH from 5.0 to 5.8.

PH adjustment chemicals should be added after all nutrients. After adding PH adjustment chemicals mix well and then give your water a couple hours for everything to stabilize. If you are using baking soda and vinegar then try to avoid using them in combination. Use either one or the other if possible. They will react with one another to form CO₂. CO₂ is great for plants leaves and flowers but is bad for plant roots.

Marijuana Cultivation/ Fundamentals/Lighting

Lighting

Lighting is probably the most crucial element in a grow. If you don't have proper lights then you won't get good results. Unfortunately, this remains true on a low budget and in order to grow indoors you will need to invest in a good light. A general rule of thumb for lighting is 2000 lumens per square foot.

Flourescent

Flourescent and Compact Flourescent lighting (CFL) is effective for growing marijuana but the spectrum is not ideal. When evaluating these lights you should always look at actual watts and not equivalent watts. These lights come in multiple spectrums but generally they are divided into warm, cool, and daylight spectrums. The daylight spectrum bulbs are ideal but you can use a combination of warm and cool bulbs in equal number as well.

Flourescents lack penetrating power and you will need to keep them within 6 inches of the plant tips except for rooting clones. For rooting clones you will want the lights about 18 inches above the plant tips. Flourescents work well for clones and seedlings that can't take bright or hot lights and also perform well for vegetative growth. Unfortunately these lights simply do not have the punch to perform well for flowering. They can be used in a pinch if you use lots of watts and a shallow grow area by training plants. Many cabinet growers do this with 150w CFL's.

These bulbs require a ballast in addition to a fixture, in CFL bulbs the ballast is built into the bulb.

Mercury Vapor

Mercury Vapor bulbs are cheap and readily available. But their spectrum makes them a poor choice for growing marijuana.

Incandescent

These bulbs are everywhere but they are extremely inefficient. You will pay a fortune lighting up these bulbs and reap little reward. These include so called 'grow bulbs' sold in stores.

LED Lighting

LED lighting has a number of advantages. The lamps have a fixed angle so no reflector is needed, all the light output is directed at the plants. LED lighting runs cool and the plants can grow right up to the lights. These lights produce light in a fairly tight spectrum and lamps are available that can be combined to stimulate all the photo sensitive hormones in the plant.

The downside is that the light spectrums of commonly available LED's aren't perfect for growing marijuana. The number of lumens output by LED's is actually fairly low and LED's are extremely expensive. This technology simply isn't there yet for growers but it will come in time.

Metal Hallide

Metal Hallide is a high intensity discharge lighting that produces a bluish light. This light spectrum works very well for the vegetative stage of growing but does not work especially well for the flowering cycle which requires more red spectrum for optimal growth. This type of lighting is very popular among growers who often purchase digital ballasts that can switch between these HPS type bulbs.

High Pressure Sodium

High Pressure Sodium or HPS is the most popular type of bulb among knowledgeable growers today. Most street lamps are HPS lighting. HPS lamps provide an excellent spectrum for flowering and although their spectrum is not quite right for vegetation there are spectrum corrected bulbs with more blue light that work well through the complete grow cycle. There are metal hallide conversion bulbs that work in HPS ballasts, and there are digital ballasts that can switch between the two types of bulb. A 400w HPS light puts out 55,000 lumens and the bulbs become more efficient up until the 600w bulb which puts out 95,000 lumens. The next largest commonly available size of HPS bulb is 1000w but these are less efficient and give fewer lumens per watt than the 600w lamps.

Special Bulbs

There are a number of special bulbs which you might encounter. You might encounter conversion bulbs, these bulbs allow you to run a lamp in a ballast intended for a different type of lamp. For instance, MH conversion for HPS ballasts and HPS conversion to MH ballasts. Additionally there are spectrum corrected HPS and MH bulbs that add blue and red spectrum respectively to make the lighting work better for growth. Yet other lamps have a reflector built into the bulb.

Reflectors

There are two reflectors you will certainly want to have. The first is on your lamp, these reflectors vary widely in price but generally you want a polished aluminum reflector that spreads the light well over your grow area. Some reflectors have hoods with an opening to attach ducting in order to keep the light cooler. There are also glass tube fixtures that ducting can connect to 'cool tubes' are the common term used for these.

The other reflector is that around your grow area. The best solution for this is some sort of reflective film such as reflective mylar. Mylar reflects 95% of light back at the plants. In a large space you might want to put the film on cardboard that can be positioned to enclose the grow to bring the walls in.

If you don't have access to mylar then flat white paint is recommended. Do not use a mirror, mirrors actually absorb light and do not use aluminum foil, it creates hot spots.

Marijuana Cultivation/ Fundamentals/Ventilation and Odor Control

Ventilation and Odor Control

Ventilation is absolutely essential to plant health. Plants absorb CO₂ and release oxygen. The roots in turn require oxygen so both must be present in your grow environment. Additionally odor control will be very important. Marijuana has a pungent odor and some strains can be smelled for miles without some form of odor control.

Negative Ion Generation

Negative ion generators can help with odor control problems. These machines will use a negative charge to attract positively charged particles in the air. These are best purchased off the shelf but you do need to know that you shouldn't actually put the generator in the room with the plants. They are said to interfere with the taste, odor, and even potency of the end product.

Ozone Generators

Ozone (O₃) is what gives the air a fresh smell after a thunderstorm. Ozone oxidizes organic particles in the air but in high concentrations can irritate your lungs. For this reason ozone generators are typically put on the timer with one on and off cycles to allow the system to output just enough ozone to control the odor.

These generators come in two basic varieties, corona discharge and uv generation. Since uv generators require longer exposure to the air the corona discharge systems are probably more sensible for most gardeners. There are plans online to make corona discharge units with neon sign transformers. This is definitely NOT recommended, these devices are a severe fire and electrocution hazard that will not be properly isolated and housed and will be placed in a wet environment. It is probably a safer and more effective idea to simply purchase a small used unit.

Odor Neutralizers and Masking Agents

One common technique for a small scale closet grow operation to build an odor remover bucket. Simply drill 1/2 inch holes around the top of a 5 gallon bucket. Fill the bucket with perlite or absorbent crystals and then add an odor neutralizer or masking agent chemical.

Odor neutralizing agents such as ONA are definitely more effective than those that merely mask odors.

Active Carbon Filtration

This technique involves forcing exhaust air through active carbon in order to filter out odors. This method is highly effective and very popular and can also be used in combination with the other methods. These filters can be purchased or you can find plans to construct them online.

Ideally, you would use your exhaust fan to pull the air through the filter rather than push air through it.

Intake and Exhaust

Unless you are adding CO₂ you should make sure that you have a highly effective exhaust system. You will want to make sure your exhaust fan is rated for high CFM under pressure. All fans will have a CFM rating, this rating is how many cubic feet of atmosphere the fan moves per minute. Your exhaust fan should be capable of evacuating your grow room at least once every five minutes. Multiply the width, height, and depth of your room to determine the total cubic feet, divide this number by five and you will have the minimum CFM fan rating needed. Of course this assumes the fan maintains its CFM under pressure and actually performs to specifications. In practice this doesn't happen. It is best to overshoot this rating as much as your budget will allow. Even if your fan does perform to specifications pulling more air through will help keep the temperature of the room down and exhaust the heat from powerful fans.

Generally squirrel cage and duct fans are used for exhaust systems. These fans can be connected to 4 inch and 6 inch flexible ducting that can be used to route the air where you want it and to pull air through a carbon filter.

In addition to your exhaust system you will need an air intake. For many systems a passive intake is used, simply providing a channel for fresh air to enter the grow room to replace the air being exhausted. For a larger area or longer intake line you may need an active intake. Providing an active intake relieves pressure to allow the exhaust and intake to share the workload of air exchange. Otherwise the exhaust fan must provide the force required to pull air into the room as well as the force required to exhaust.

CO₂ Supplementation

CO₂ Supplementation yields dramatically larger flowers than growing without adding CO₂. The idea is to replicate earlier geological conditions when atmospheric carbon dioxide levels were higher and plants grew far larger than they do today. The ideal level of CO₂ is between 1500-2000 ppm. There are many ways to add this CO₂. CO₂ moves very easily and weighs more than oxygen. Because of this you will want fans to be off during the period in which you are supplementing CO₂. Because plants only utilize CO₂ for photosynthesis you will only need to supplement during the lights on period.

Fermentation

This is done by fermenting sugars with yeast. Sometimes even basic sugar and water is used for this purpose. Others use a more sophisticated blend with nutrients for the yeast. You will need to use an airlock (tubing coming out of a sealed fermentation vessel or jug and placed in a cup of water so the CO₂ has to bubble out through the water will work). This method is very cheap and easy to setup but while every bit helps this will not raise your CO₂ levels to the ideal 1500-2000ppm.

Dry Ice

You can generate CO₂ by simply melting dry ice (which is frozen CO₂) but it is difficult to control the speed of release to precisely control the CO₂ levels. Additionally you will need to add ice each day and the ice can not be kept in your freezer.

Vinegar and Baking Soda

When vinegar and baking soda react they release CO₂. You can produce CO₂ at a controlled rate by utilizing a drip system.

Propane Burners

Propane burners generate lots of CO₂ and can be controlled but they also generate lots of heat that must be exhausted.

Stored CO₂ Cannisters

These can be purchased with cash at any gas supply shop. This is the least expensive and most controlled way to supply CO₂. The downside is that there is a high up front cost and a few calculations are required to determine how to setup the system and output CO₂ at the proper rate.

The details of the setup will vary based on your equipment but there are a few basic components you will need to use this method. The first is a tank. Tanks must be refitted with new seals periodically. Generally a gas supply will exchange your cannister with another that has a similar amount of time left on it rather than fill the cannister on the spot. In addition to the cannister itself you will need a solenoid switch to allow you to use a timer to control when the tank releases gas and when it does not. A regulator is needed to regulate the pressure to a lower and fixed pressure that won't damage your other equipment. To the output of the regulator you will need a flow meter with needle valve. Usually this will consist of a tube with increment markings and a little ball that raises to show you how much CO₂ is flowing through the flowmeter. This allows you to fine tune the output of your CO₂ system. Finally you will need plastic tubing with holes in it in order to actually distribute the CO₂ around the grow area. Remember CO₂ is heavier than air and will fall downward when released out of the tube. This means you should position the tubing above your plants.

You can purchase all of these components aside from the cannister as kits sold for hydroponics. Follow the directions that come with the kit to set your timer, flowmeter, and regulator.

Marijuana Cultivation/ Fundamentals/Temperature Control

Temperature Control

Marijuana can survive between the temperatures of 60F to 92F but those are not ideal temperatures, those are the extremes the plant can generally survive without dying. Ideal temperature control allows you to grow larger and higher quality marijuana with denser buds. In fact, once the basic nutrient and light needs of the plant are met temperature control has the greatest impact on flower density of any other element.

The ideal range for marijuana is 75f-83f. Flower density will be determined not so much by the temperature you grow at but by the range of temperature. It is better to have plants that sit at 85f during the day and 83f at night than 75f at night and 83f during the day.

Getting those temperatures and temperature ranges can be quite a challenge but there are tricks to help. One simple trick is to have the hot lights run at night and have the dark period occur during the daytime hours. A small space heater or heating pad can be used to raise temperatures if needed. And of course airflow and air conditioning are a great way to remove heat and hot air from your grow environment. If your grow is closed for CO2 exchange then a dehumidifier is a great way to reduce temperatures.

Marijuana Cultivation/ Fundamentals/Grow Mediums

Grow Mediums

Grow mediums exist to provide a stable base for your plant to grow its roots through and to hold up the weight of the plant. Over the years many substances have been found to fill this role and they have different properties. Often a grower will use one or more of these mediums depending on the methods he has chosen for growing and the desired properties of the medium in the container being used.

Soil

Good old earth. Soil is actually a composite of a number of substances and varies from on location to another. Soil is typically composed of rock, sand, clay, and organics. Organics are decomposed plant and animal matter and provide the nutrient content that is contained in soil, clay binds soil together and retains moisture, rocks and sand provide drainage to allow for root oxygenation. Additionally soil is usually teaming with microorganisms that are feeding on and breaking down the organics contained within it.

If growing a potted plant indoors you will probably want to mix at least perlite with your soil to enhance moisture retention. It is also highly recommended that potting soil be used in a pot rather than soil that you have dug from the ground. A potting mix can be more carefully designed for optimal plant health and the soil outside will contain many unwanted forms of insect life that can and will infect and kill your plants.

Another common concern with soil is that potting soils often already have fertilizers in them (in addition to the nutrients contained in the organics). In general, try to avoid potting soils with time release nutrients but if you do purchase a bag, be aware that the plant will not need any nutrients for a period of time and just water with clean water to avoid burning the roots.

Perlite

Perlite is a porous white substance that is very absorbant and excellent at retaining and wicking moisture. Perlite is often used for cloning and mixing with other grow mediums but can also be used on its own. Growers who use perlite as a sole grow medium will often purchase large coarse chunks rather than the smaller porous perlite that is more readily available in most areas. It is not recommended to use perlite in a circulating system because the fine dust that comes off the perlite will clog pumps over time. The same fine dust brings a recommendation that when handling perlite you utilize a respirator device so that the dust does not harm your lungs.

Perlite is completely inert substance so will not interfere with your feeding schedules. That said, there are manufacturers such as Miracle Grow that put nutrients in their brand of perlite even though it is not indicated on the label. This material can be used but should be flushed thoroughly with water to wash out the nutrients. Perlite should be washed anyway to remove the fine dust that builds up in it.

Vermiculite

Vermiculite is a crushed volcanic rock medium that provides excellent drainage when mixed with other grow mediums. Vermiculite is inert but is not particularly suitable for use as a grow medium by itself.

Rockwool

Rockwool is literally spun rock. Much the way sugar is spun into cotton candy the rock is spun into a material that looks similar to the spun glass used for insulation (but not so itchy). Rockwool is completely inert and most growers are using rockwool in some form. If allowed free drainage rockwool will retain just the right amount of moisture and drain the rest off.

Rockwool comes in multiple sizes of cube. There are smaller cubes or plugs that are typically used for seedlings or clones and larger blocks that are used in hydroponic systems such as ebb and flow trays. Some of the large blocks have holes in them to make it easy to insert the small plugs or cubes you used to clone the plant directly into the larger block

The only concern with rockwool is that it should be completely submerged in water for 8hrs prior to use in order to remove any air bubbles in the medium.

Hydroton

Hydroton is one name for a medium that consists of lava rock or clay pellets that are available in different sizes and usually have a red coating on the outside. This inert medium is effective in continuous drip and ebb and flow systems. It is also an excellent choice anywhere you need drainage and some have used it for the bottom couple of inches of a hempy bucket to facilitate free drainage.

Coconut Fiber

This is a fairly new medium that many are beginning to use. Coconut fiber offers some of the buffering capacity of soil, drains well, retains enough moisture to be useful, and has little nutrient content.

Seedlings

Marijuana Cultivation/Seedlings

Seedlings

Selecting Seeds

Good marijuana simply can not be harvested from poor seed. There are thousands of strains of marijuana and established seed lines and breeders. All of these have different characteristics for you to select from. Among the traits to consider are size, duration of flowering period, yield, type of psychoactive effect, strength of psychoactive effect, THC content (this is NOT synonymous with psychoactive potency), odor, taste, and visual effect. The odor, taste, and visual effect combined are often referred to as 'bag appeal'.

Quality of Source

The quality of source seeds is something you need to consider. Your sources can range from bag seed from dirt weed to clones from a plant with known premium pedigree properties.

Any grower will tell you that smokers don't know what is good and what is not. There are no shortage of smokers who have only experienced good marijuana in the form of a midgrade. These individuals tend to refer to any decent mid as skunk or chronic. There is nothing wrong with that but if you are one of those individuals you are about to attain a new level of awareness.

One thing you should note is that the quality of the buzz is actually more important than the potency. It really doesn't matter how potent the marijuana is or how high the THC content. A plant with a strong couchlock or cerebral high will have a peak effect and the potency of the plant only changes how much material must be used to achieve that effect. The end result of smoking lots of low potency marijuana is the same as smoking a smaller amount of the most potent and highest thc content marijuana with the same kind of buzz. This can be observed by smoking a sinsemillia bud and a pollinated bud from the same mother. Both will have the same effect, you just have to smoke more of the lower potency seedy material.

Bag Weed

Bag weed is a mystery. The genetics hiding in those seeds could hold many surprises and could hold the next great pedigree plant or they could hold nothing more than dirt weed. When evaluating bag weed there are a number of indicators to look for. The first is packaging. If the marijuana is packed in a brick or pressed into tight chunks that is has to be broken off of then this indicates that it is a heavily commercialized strain. This is fairly consistently low quality material. The next indicator is seediness. It is perfectly possible to lower the quality of premium marijuana by pollinating it but this sort of carelessness indicates that the grower either didn't care about what he was doing or didn't know. It is a fair bet that said grower didn't care or know about the strain either. Another important indicator is color of the plant material. A very dark brown, almost black indicates a highly competent curing method, next up is a nice green plant material that doesn't smell grassy

and reveals the color of the hairs, purple plant material will tend to have less potency potential among pedigrees but has excellent bag appeal and generally will be of a pedigree strain, the absolute worst things to see are a light green plant material with a grassy smell and light brown material.

Now having considered those qualities you will of course want to consider the buzz delivered by the material, side effects like paranoia, dry mouth, and appetite stimulation. Also important is odor and appearance. Not all pedigree marijuana has a strong odor but a strong odor is usually a good sign. And of course taste is important. Some marijuana strains even have a nice fruity taste.

Purchased Seeds

One easy way to acquire excellent genetics is to simply purchase from a known and reputable breeder. There are many online seed companies that are reliable and will ship anywhere in the world. You do need to be cautious because the companies do not verify that seeds are legal in your location and leave that burden upon you. If you try to import seeds where they are not allowed by law you risk losing the money you invested in the seeds.

Things to look for in seeds are feminization (if done by a competent breeder these seeds do NOT carry an increased probability of hermaphroditism). Feminized seeds produce all female plants. This is desirable since in regular seed only about half are females. You will want an all female crop in order to prevent pollination and grow sinsemillia weed that is much more potent. Since only the female plants are desired half of the seeds you purchase will be wasted with regular seeds. It will also leave empty space in your grow area.

Another important trait to look for are seeds which are F1 Hybrids. F1 Hybrids are genetically more desirable. These seeds are from the strains original parent plants. Seeds from two F1 plants of the same strain would be F2. With each successive generation of inbreeding the genetic stock becomes weaker. F1 plants will also be more likely to enjoy what is called 'hybrid vigor'. Hybrid vigor is a phenomenon that sometimes occurs in hybrid crosses causing an incredible vigor and growth in the offspring produced by the cross.

Clones

Clones obviously aren't seeds, but they are cuttings from a mother plant and used to propagate genetics and start gardens. When grown out the cutting will have the same genetics as the mother plant and therefore all the same characteristics. There are locations where you can sample marijuana and then purchase cuttings from the same mother as the plant that produced it. Obtaining a cutting of known quality genetics is the best way to obtain genetics. If this option is available to you then you should go with it. Cuttings can be taken from any marijuana plant so if you have a friend that grows you might be able to acquire excellent genetics. As an added bonus, since cuttings are clones they also share the gender of the parent plant. This means cuttings from a female plant will always be female.

Basic Types of Plant

It is worth having some understanding of what strains of plant are out there. This lets you describe what you are growing and understand what others are growing.

Cannabis Indica

Indica plants are short, bushy, mature early, have more chlorophyll and less accessory pigments (accessory pigments protect the plant from excessive sunlight). Indicas are very resinous plants that provide a body buzz couch lock effect.

Cannabis Sativa

Sativa plants are taller, take longer to mature, have less chlorophyll and more accessory pigments. Traditional botanists tend to mislabel all cannabis as cannabis sativa. Sativa plants have much higher yields than indicas and have a very cerebral buzz. They are typically very consistent maintaining the same results from one generation to the next.

Ruderalis

Ruderalis plants are typically very short and extremely low potency. Ruderalis do have one interesting trait. Other strains of marijuana flower when the light output is reduced to twelve hours a day, allowing a build up of a light sensitive hormone in the plant that tells it winter has arrived. Ruderalis plants autoflower even under a 24hr light cycle. For this reason there are crosses between potent indicas and sativas with ruderalis to attempt to create a plant with higher yield and greater potency that flowers automatically. This offers the benefit of having the plant enjoy as much photosynthesis during its lifecycle.

Hybrid

A hybrid is a cross between two or more of the other strains of plant. Most commercially available strains are hybrids with varied amounts of indica and sativa. There are a few ruderalis hybrids as well.

Germinating Seeds

A great deal is made of germinating seeds. In truth the process is simple and if done correctly will give excellent results, generally 90+% germination rates.

In order to germinate seeds you should take a paper towel and fold it in half and half again. Wet the paper towel thoroughly with reverse osmosis filtered water and place the seeds in the crevice made by the last fold. Close the paper towel and place it on a plate. Then place the plate in a dark place and check it 24hrs later. Continue to check every 8hrs keeping the paper towel moist until the shell of the seed opens and a white shoot comes out. This will typically occur within 72hrs. Now that the seed has sprouted you can push it into your desired grow medium. It is best to sprout your seeds in either a small rockwool cube or directly into the same grow medium you plan to use in your final grow. This will reduce stress on the plant when you transplant it.

From Sprout to Seedling

Once the germinated seed is placed in grow medium it should be watered with plain water until it sprouts. When it sprouts it will have two small round petals. This is considered a sprout. You should continue to water with clean water at least until the first set of true serrated edged leaves form and the two small round leave brown and die. This is normal, the plant uses those leaves as a sort of parachute to allow it to utilize the nutrients stored in the seed itself. During this stage of growth the plant is very delicate and should only be placed under fluorescent lights.

At this point your sprout is now called a seedling. If you sprouted in a rockwool cube you should either place it into your desired grow medium and begin feeding with a weak 1/4 strength nutrient solution or if you have it in soil you can just continue to water as is since there should be nutrients in the soil.

Vegetative Growth

Marijuana Cultivation/Vegetative Growth

Vegetative Growth

The vegetative growth cycle is about growing the plant mass in preparation for flowering. Outdoor you will have several months of vegetative growth. Indoors you can have as little as a week (if using clones), 4-6wks (typical), or as much as you want.

Lighting

The adult life cycle of the marijuana plant consists of two stages of growth. Vegetative and Flowering. The plant determines which of these stages of growth it should be in through the presence of a flowering hormone which is sensitive to light. As long as light levels above 12-14hrs are maintained the flowering hormone will never be present in high enough levels to induce flowering in the plant. At any point during the plants life if the light is on for more than 12hrs a day it will cause the levels of flowering hormone to be reduced and the plant to revert to the vegetative growth stage. If a plant is reverted during flowering by irregular light patterns it can cause stress in the plant and stress can cause hermaphroditism. A plant can be maintained in vegetative growth without being allowed to flower indefinitely with no adverse effects.

Typically indoor growers who can control their light cycles will use either 18hrs of light per day or 24hrs of light per day. There are mythical claims that a darkness period is needed but there is no evidence to support this. Extremely healthy and potent marijuana is grown under 24hr vegetative light. What is in dispute is whether the extra light hours bring a great deal of benefit compared with 18hr light. Most 24hr growers claim some increase in plant vegetation but few claim a large increase.

Feeding

During vegetative growth you will want to use a fertilizer that is high in nitrogen at full strength. Nitrogen is used by the plant to grow stems, leaves, and other green parts and so is absolutely essential to the vegetative phase of growth. As always you should begin with the manufacturers suggestions for the period of growth you are in when adding fertilizer and then adjust up or down based on how your plants respond.

There is another section on plant problems but a good hint to know at this stage is that it is common to mistake too many nutrients or PH misadjustment for nutrient deficiency. Always carefully check PH before adjusting nutrients to fix a problem and if adding nutrients doesn't seem to be fixing your 'deficiency' try flushing the system instead. Unlike the drooping leaves that result from under or over watering yellowing and necrosis from nutrient problems generally don't recover but they stop getting worse and new growth will be green and healthy.

Training and Trimming

Different techniques have developed for training plants. The goal of training a marijuana plant is to optimize yield with the available light and space. Outside a plant in the middle of a clearing with a full year of vegetation can probably be left to do what it wants and give great yields. Indoors the light is more precious and many growers are using small cabinets. They just train their plants to utilize the space they have.

A couple things that any grower should be aware of are that leaves are solar panels. You might be twisting and directing the branches but the plant knows better than you when and where it needs leaves, leave them alone. If a gentle pull on the leaf doesn't cause it to give way immediately then it is healthy tissue. Usually you will only want to removed browned leaves. With a thick canopy under indoor light the lower growth will yellow and die, this is because the plant isn't getting much light there and steals the nutrients from these now unneeded leaves. This is nature at work and not always a sign of too much or few nutrients.

Another thing that is important to know is that the tops of the plant produce the most potent and largest flowers. Most training techniques focus on maximizing the number of those top flowers and on removing smaller lower flowers the plant will direct all its energy to the larger tops. How much difference different training techniques make is debated but trimming lower growth that is far from the light is universally agreed to improve yield. Any time you bend a branch horizontally it will cause the plant to produce a hormone that encourages lateral growth.

When training plants you will occasionally snap a stem. It happens. Plants can usually recover from this. Just position the stem back together and tape it in place. Give the stem time to recover before applying more pressure to that spot. A small knot will develop at the break and in the end the plant stem will grow back healthier and stronger than before.

Jogging

Jogging also known as the jungle of green or JOG technique is a useful way to maximize the yield from your crop. It is very effective in a low grow space as well.

With the jog technique you will use wires shaped into "U"s to hold down the stem into the desired positions as you gradually shape it around the perimeter of the pot. The goal is to make the plant entirely fill the pots space with top buds. No matter how much training you do a plant will have a genetic maximum bud capacity that can not be exceeded. Training will help you reach that potential but nothing can allow you to exceed it.

Sea of Green

Sea of a green is a technique whereby you grow a far greater number of smaller plants rather than a small number of large plants. Usually clones are used for uniform growth characteristics and each plant is trimmed so that only the main stalk grows.

Screen of Green

With the screen of green technique a screen of wire such as chicken wire is held up as a horizontal plan above the plants and the plants are nudged through the screen to create a uniform canopy so that all the light is utilized by growth. Generally anything below the canopy is trimmed off.

LST

LST is a technique where a plant is trained through the use of ties or ropes. The idea is that you use a support rope at the base of the plant pulled one direction and another tied to the top pulling it down in a different direction. Every couple days the top will be pointing upward again while axins (branching hormones) reach the other nodes. Each time the top pulls up above the other branches the top rope should be moved up and the top pulled down. Continue doing this until the top does not pull above the other branches.

Topping

Topping one of the oldest tricks. No matter what you have heard topping is not clipping off bud tops. Topping is removing about 3/4 of the top growth tip. This will cause the plant top to split into two tops. This technique can be used to produce up to about 4 tops on a plant.

Cloning

Marijuana Cultivation/Cloning

Cloning

Okay so this is where we cue Doctor Frankenstein's lab. The doctor cackles madly and the lighting strikes just as he switches the lever. A moment later there is grunting from the form under the blanket and the doctor screams "It's alive!!!"

Or maybe not. Cloning a plant doesn't require a cleanroom, it doesn't require a lab. No men in white coats, no special chemicals or treatments. No high school biology let alone a degree. People have been cloning plants for thousands of years and its extremely easy to do. The simplest way to clone many plants is to cut off a piece of a plant and toss it in a glass of water. Stick the glass in the window, wait a few days and presto roots will sprout from the bottom of the cutting. At this point your cutting is now a clone of the plant it was cut from. For plants cloning and regeneration are a process that is completely natural. It happens to them regularly during the simple rigors of existence.

Why Clone?

Basically you clone when you want to be able to replicate the exact genetic characteristics of a plant. If you have found not only a good strain but a particularly fine specimen you can share it by cloning. Or you can keep the fine plant in the vegetative stage forever and only grow out and mature cuttings of it. Not only do you have a plant with known properties such as potency, potential yield, disease resistance, size, etc but you will be able to have a garden of plants that given the same conditions will more or less grow at the same rate and respond to the same way to different training methods. Your plants will all have the same nutrient requirements as well.

Cloning is also an ideal way to determine the sex and properties of potential mother plants without every having them undergo the stress of flowering. This is much better than taking a cutting during flowering or putting a flowering plant back under a longer light cycle to revert it back to vegetative growth. Stress can alter or damage genetic material and that genetic change will be passed to the cuttings taken from the mother after that point.

Rooting Hormone

Rooting hormone is completely optional. It often comes as a gel or powder that you apply to the base of the stem of your cutting to stimulate root growth. An alternative that seems to yield excellent results when compared to plain water or commercial rooting hormones is a dip in asprin water. Just crush up two extra strength asprin in a half liter of distilled water and let sit with occasional agitation overnight. Now dip your stems in the asprin water instead of rooting hormone before putting them in the medium and you will have excellent results.

Cloning Devices

When you take cuts you are going to need to something with them to keep them in ideal conditions until they grow roots. Obviously you will put them into a medium but then what? Here are a few devices used for this purpose.

Two Liter Bottle Method

This is probably the cheapest and easiest consistent method to root a small number of clones. Just cut the bottom 40% off a two liter soda bottle put a clone in rockwool or a whole small jar with another medium inside the bottom. Cover with a plastic bag and hold the bag down with a rubber band. Before sealing give it a puff of exhaled air to fill it with CO₂.

This traps humidity and it is normal and desirable for moisture to condense on the container. You will need to exchange air every day until roots appear.

Humidity Dome

The most common tool used is the humidity dome. These can be purchased for \$10-\$15 U.S. Dollars at any hydroponic shop and consist of a plastic tray that is just the right size for a sheet of small rockwool cubes to fit inside of. There is then a clear plastic cover that fits on top of the tray to trap humidity. Depending on the number and size of clones you will need to exchange air between 1 and 3 times a day.

Bubbler

These can be purchased or constructed. Essentially this consists of a tray with a cover. In the cover there will be numerous net pots and in the tray will be water and aquarium air stone strips. The strips bubble air through the water causing the bursting bubbles to moisten the medium in the net pots. These can be used with or without a humidity dome cover. If a cover is used air exchange is required as per a simple humidity dome.

Wick Cloner

These simple and prolific cloners are generally constructed rather than purchased. A system similar to the bubbler is used with a tray and cover. Instead of net pots the tray has half pint plastic containers suspended over the water. A wick, usually a 1 1/2 inch piece of shoelace or strip of cloth then goes from a hole in the middle of the bottom of the container down into the water. The containers are then filled with perlite. The wicks pull up moisture into the perlite. A dome cover is not used with this method.

Taking Cuttings

Taking Cuts

This is the easy part. You will want a pair of sharp scissors and a cup of water handy. When you take a cut put it into the water immediately. Cuttings should be about four inches long. You must have a growth tip to take a cutting and will want a couple nodes past that.

Prep Cuts

After you have a few cuttings or all your cuttings take your glass of water over to a sink. You will need a sharp knife or razor for this step. You should prep and plant each cutting entirely before moving the next. Remove all leaves except for the top set. Clip the leaves on

the stop set so that long half their length is present. Place the stem of the cutting under water either submerged in a pool of water or under a stream in the sink. Cut the stem at a 45 degree angle. This prevents air bubbles in the stem that would prevent moisture uptake. Finally score the about the bottom 1/4 of the stem. You only want to score the skin of the stem and not cut into the stem itself.

Planting the Cuttings

Dip your prepared cutting into aspirin water or any rooting hormone you have (if any) and then plant in the container and/or medium you will be using. Try to plant all stems approximately the same height and just enough to give good purchase in the medium.

That's it, use one of the aforementioned systems to care for your clone for the 7-14 days until it grows roots (yellowing in the leaves is often a sign that roots are developing). Not everyone will have 100% success so take extras cuts. This lets you pick the healthiest clones. After roots form you should plant the clones within 7 days and feed only 1/4 to half strength nutrient until they are healthy (about 7 days after rooting). Clones should be treated like seedlings. One major difference is that clones are sexually mature as soon as they root and can be flowered immediately if you so choose although most growers give them a veg period.

Generational Cloning

This is the chance to squash another myth. To cut to the chase, a clone of a clone of a clone of a clone can be taken for at least several hundred generations out without any negative effects to the plant. In fact, replacing your mother with a fresh clone from healthy tissue often will mean less genetic damage due to stress and aging over the life of the plant.

Sexing

Marijuana Cultivation/Sexing

Sexing

Sexing is an important part of the growing process for marijuana. It is the source of much unneeded worry for beginning growers. The reason you will want to sex your plants is so that you can remove males. Males have little potency of their own, it is the flowers of the female that you will want to cultivate if you are interested in psychoactive effects. Without chemical extractions the flower of the female is the only part of the plant that can be used for medicinal and recreational use.

It goes a bit beyond that though. A female plant that is not pollinated will direct the bulk of its energy later in its growth phase into developing the flower buds and swelling them with the resin that carries the bulk of marijuana's potency. The plant does this so that the large sticky flowers are more likely to catch pollen. If the flower is pollinated it will instead direct the bulk of its energy to seed production. This is where low quality dirt weed comes from. If you have seedy pot, it is dirt weed. The more seeds contained in the pot the lower the quality. And of course seeds add dramatically to the weight since they weigh more than the bud itself, this is sharply contrasted with stems that are mostly water weight and have a negligible weight compared to the bud.

Plants generally should demonstrate their sex one to two weeks into flowering. During the first ten days of flowering there is very little need for concern about males pollinating your crop. Additionally, if you reproduce by cloning you will only have to worry about males once.

Identifying the Male

Males can be identified by looking at the inter-nodes where leaf and branch stems connect with the main stalk. Male flowers will contain balls somewhere between the size of a marijuana seed and a popcorn seed. One ball is not definitive since female pistils sometimes split from a small single ball that opens. But two or three balls in a cluster is sure confirmation that you have a male. Males should be removed and destroyed to prevent them from releasing pollen. The pollen transports easily so the males can not be safely grown anywhere that shares an a/c or ventilation system unless special precautions are taken.

Identifying the Female

Females are very simple to identify. They sprout white hairs. A small ball will form and split and two tiny white hairs like translucent threads will split out. These hairs are called pistils and intended to catch pollen. Later when the plant is not pollinated these hairs will change color.

Pistils may guarantee that your plant is not a male but your plant could still be a hermaphrodite. You must watch plants grown from seed carefully for male flowers and even a trusted clone if it has undergone stress such as light during its dark period, lack of watering, or being left to flower far past maturity.

Pre-flowers

On certain strains what are known as pre-flowers may appear while the plant is still in vegetative growth. This is perfectly normal.

Cloning for Sex

No this is not the title of futuristic fantasy movie. You can always revert a mother to veg in order to take cuttings and can even take cuttings during flowering (although success rates will be lower and rooting will take longer) but this process induces stress on the plant that can and does cause hormonal and genetic changes. It is much better to have a mother plant that has never been flowering.

Recognizing this, people have begun taking clones from their vegetating plants when they reach maturity. Once the clone is rooted, you would either flower the original plant or the clone and keep the other under 18hr or 24hr light indefinitely.

Flowering

Marijuana Cultivation/Flowering

Flowering

The majority of marijuana cultivators are cultivating for unpollinated female flowers and breeding purposes. Naturally most readers are highly interested in this particular phase of adult marijuana growth. The truth is that flowering is actually pretty simple.

When do I Flower?

When to flower is a decision every grower must make for themselves. During the flowering stage a plant may grow between 2 and 2 1/2 times the size it achieved in vegetation. An indoor grower in particular will need to plan space accordingly. Up until the grower will have been trimming and training plants and during flowering these things should be avoided if possible so a grower with limited space should also remember that.

One thing that must be remembered is that whenever you want to flower your plant will need to have reached a level of maturity where it is producing alternating nodes. If grown from seed this will usually occur a few weeks into vegetative growth. Clones taken from a mature plant will be sexually mature upon rooting and can be flowered immediately.

Another important thing to look for during flowering is yellowing leaves. Particularly toward the end of flowering plants will begin robbing nutrients from their leaves. This is perfectly normal and nothing to be alarmed about. You do not need to make an effort to remove the leaves unless they are brown and dead.

Lighting and Nutrient Changes

In order to make a plant flower you will need to reduce its light cycle down 12hrs a day. During flowering it is absolutely essential to make the dark period as dark as possible and to never interrupt that cycle with light. Light up to the level of moonlight can be present without preventing the plant from flowering but any light reduces flowering hormone and will reduce the output of your plants. Light interruptions during the flowering period causes stress on the plants and can result in stress induced hermaphrodites. Attempts to remove all the pollen sacks on hermaphrodites are never successful and will result in a seedy crop.

You should begin your flowering nutrient (high in P). Some growers believe that it is important to begin using flowering nutrients 1-2wks BEFORE switch over the light for flowering. Others begin flowering nutrients when they switch the light. There may be benefits to switching nutes early but it is certainly not a requirement.

Growth and Rough Timeline

It should be noted that this is just a general average guideline. There are wide variations from this, some strains will move faster and other much more slowly. In some cases that wait is worthwhile and in others it is not.

1-2wks - During this time your plants will be changing over to their flowering period. It is generally during this time that the first evidence of flowers will appear.

2-4wks - During this time the plants will begin to stretch for the light. Flowers will appear at all the nodes but they will be light and airy no matter what you have done.

5+ - During this period you will likely see lots of yellowing on leaves and if you have done everything else right you will see the buds fill in and thicken substantially.

Last two weeks - During the last 1-2wks of your plants life you will want to water it with clean water and feed it no nutrients. Before the last 72hrs you will want to flush the grow medium thoroughly. During the last 24-48hrs you should shut off the lights (thc is light sensitive and the plants will be utilizing sugars already produced by photosynthesis during this period). Overall this will increase taste and potency by flushing the plant of fertilizers and sugars which simply don't taste good when burned.

Supplements

There are a plethora of supplements on the market and no attempt will be made here to list them all at this time but there are a few general types that most flowering supplements fall into that can be addressed here.

Sugar supplements such as sweet, molasses, etc - This type of supplement does NOT feed the plant directly. Plants can not utilize already processed sugars like this. What this does do is nourish organisms living in the grow medium. If you are using an organic grow process or growing in soil this can be very beneficial but should be stopped during the flush period.

Hormone Supplements - Naturally the effects depend on the hormone but all in all these are beneficial but expensive. Plant growth hormone extracted from algae is helpful but provides far more benefit during the vegetative grow cycle than the flowering cycle. Plant flowering hormones are beneficial during flowering, largely for creating more flowering sites than without. All hormone supplements tend to be very expensive which limits their practical utility.

Taste enhancers - There are products with citrus and other flavors that claim if you feed them to plants the plants will take on some aspect of their flavor. This is generally reported to be false.

Nutrient supplements - Some boosters are simply more flowering nutrient. How well they work depends on how ideal the mix you are using is already.

Calcium/Magnesium Supplements - These are very useful for balancing out your nutrient mix, this underrated nutrients are important for plant growth. The use of a supplement like this is highly recommended for all phases of growth.

Harvesting

Marijuana Cultivation/Harvesting

Harvesting

Harvesting marijuana is a joy and a blessing, until it becomes a pain in the arse. There is a great deal of work involved. Some strains will be more work than others but you can be certain that harvesting and trimming a crop will require a considerable time investment as well as sore hands and fingers.

When do I Harvest?

The best way to determine when to harvest is to examine the maturity of the trichomes. Trichomes are the resin glands of the plant and their level of maturity gives you an idea of both how mature the plant is and the effects you can expect from the plant if harvested at a given stage. In order to examine trichomes you will need a pocket microscope, these are commonly available for about \$15 USD in 50-100x magnification, 50x should be plenty.

Trichomes are stalks with a head at the tip, it is the tips that you will look at. You will want to look at the trichomes in a couple areas over the plant to get a good idea of the overall maturity. The tips start out clear, then later will begin to cloud, finally the tips will turn amber. Clear trichs aren't very potent, the ratio of cloudy to amber is really what you want to look for. The more amber the trichomes the more of body physical stone the pot will deliver. A heavier ratio of cloudy will deliver more of a soaring mental high. All of this is of course relative to the general effects provided by the strain. Most harvest at 30-50% amber, it is not recommended to go beyond 75% amber.

What to Cut

So its time to harvest but what should you cut and how do you go about it. Well the truth is that this is personal preference. Regardless of how you cut and trim your plants you should touch the flowers as little as possible and avoid breaking up the buds. Damaging the delicate trichomes will reduce the potency of the marijuana.

One way is to leave the plants in their pots (more or less intact) and spread out a couple news papers. Toss large sun leaves on newspaper and do small bud trimming over the other.

Start with the sun leaves and then trim progressively smaller. This way you will have less in your way. For now, leave the buds on your stems. For trimming the buds, first take all the tiny popcorn lower buds and put them where you are going to put your trim these won't be much of anything when dry. Next trim the actual bud leaves, this trim will have lots of trichomes so should be saved to make oil, butter, or something else so they don't go to waste. To trim the bud leaves start with leaves that you can see a stem on and clip off at the stem to remove. Then begin to trim in a circular motion around the bud until you have cut back to the sugar coating. Trimming past this point is just wasteful. Don't worry if they look fluffy or leafy, they will dry and cure into sticky potent buds if you've done everything right.

This should leave you with all the buds on a nice thick stem network that is suitable for any drying/curing process you want to use. Some drying processes will involve just clipping at the main stem and hanging upside down to dry, others will require you to further break down the plant into smaller bud pieces. When you do this leave enough stem for you to handle and work with the flowers you can and likely will trim down the stem later and dried stem doesn't weight a significant amount compared with dried bud. Also, you will find that you can trim the large top buds into smaller buds one node at a time. It is better to leave as large of a single bud mass as possible.

Curing

Marijuana Cultivation/Curing

Drying and Curing

Drying and curing marijuana is a critical step in the growth process. During this stage you can lose, preserve, or cultivate odor, flavor, and potency. Odor and flavor must be carefully cultivated. The drying and curing process allow the plant to purge sugar and if desired to purge chlorophyll (although some have developed a taste for the chlorophyll in the plant).

Improperly dried and cured marijuana can lose almost all of its original potency and lower potency marijuana can be concentrated to slightly higher potency if handled properly. Four things reduce the potency of marijuana those things are exposure to light, heat, damage to the plant tissue, and air. Additionally, marijuana that is not dried and stored properly can contain too much moisture and grow mold. It is important to remember that many rapid drying techniques will dry only the outside of a compact flower and that slow techniques like curing may be needed to draw that moisture to the surface.

The virtue in drying and curing as with all stages of growing is patience.

Air Drying

Air Drying is probably the popular method of drying marijuana. It can be very well controlled, by controlling the amount of airflow, you control the speed of drying. A common technique to suspend the plants upside down in a room with a circulating fan blowing (but not actually blowing on the plants themselves) to keep air moving. Another technique to put the buds on a half open drawer or tray in a place with moving air. The further along in the drying process the more you close the drawer to reduce airflow.

A simpler way to dry the marijuana is to put the buds in a layer in a brown paper bag. This is simpler but faster and therefore the output is less desirable.

The speed in this process is a trade off. If you dry too fast then it will take longer to cure the marijuana properly. If you dry too slowly you will be exposing the marijuana to more air therefore reducing potency. Many growers shoot for about seven days drying time. If you are not going to cure the marijuana the plants should be dried until the stems snap easily rather than bend. If you are going to cure then you can begin with slightly more damp (but still mostly dry) marijuana.

Dry Ice Drying

Because light, heat, and air all degrade potency someone came up with the idea of using a can or other container in a freezer or using a cooler to dry the marijuana using dry ice. Dry ice can purchased at most any supermarket and is simply frozen carbon dioxide gas. You won't want to touch the ice directly but by using about the same amount of ice as marijuana you can dry your weed out without exposing it to air or light and certainly not heat! Simply lay down a layer of dry ice, put an insulating layer of breathable cloth over it like a cheesecloth or a simply kitchen towel. Then lay the buds spread out on top of the ice. Make

sure there is a way for the gas to escape as the dry ice evaporates.

Dry ice never becomes liquid, it sublimates directly into a gas form and carries moisture away from your bud when it does. Once all the ice is evaporated your bud should be dry. If not, put a little more ice in and repeat until it is dry.

Microwave and Oven

A microwave and an oven both dry marijuana using heat. You can cover bud between layers of paper towel in a microwave or use an oven on the lowest setting with the door cracked open to dry marijuana but heat can and will degrade the potency of your final output dramatically.

Food Dehydrator Drying

Food dehydrators can be used to dry marijuana along with most other materials but are not recommended for this purpose. Food dehydrators use the direct application of rapid air movement and in most models the application of heat to dry materials. As explained previously heat and air will degrade the psychoactive components in the marijuana such as THC.

Slow Cure

So now that your initial drying is over you need to distribute the remaining moisture evenly through the bud because right now its all in the middle. You also might want to remove some more of that moisture and maybe some chlorophyll with it.

The traditional technique is the slow cure. With the slow cure you will put the material into a sealed container such as a glass jar or tupperware container in the fridge until moisture rises from the center of the bud to the surface. When the buds feel more you will sit them out in open air until they feel dry again and then repeat. The period of time before the moisture is drawn out will become increasingly larger. Most growers recommend curing like this for a minimum of two weeks. Some cure their marijuana for years.

Water Cure

Water curing is an innovative idea. The resin in marijuana is not water soluble, so everything in the plant that is water soluble is an impurity. Water curing involves taking dry marijuana and submerging it in distilled (or at least not chlorinated) room temperature water (room temp is important, heat degrades potency and cold will make trichomes brittle). Change the water daily. This can be done for anywhere from 3-14 days and results in a dark chocolate brown marijuana. We marijuana is wet marijuana and the same slow drying techniques should be used to remove the moisture from the marijuana the second time around to insure complete drying.

Sweat Cure

This is often done third world countries and is similar to how tobacco is commonly cured. Pile your buds into a pile of alternating layers. Shift around the buds periodically. This will cure and brown the marijuana quickly but is using heat to do it. This technique will reduce potency and helps breed harmful fungus and bacteria. For these reasons it is not recommended.

Producing Seeds

Marijuana Cultivation/Producing Seeds

Producing Seeds

Sooner or later every grower is going to want to produce marijuana seeds. Developing a new stable strain is beyond the scope of this discussion and requires the ability to grow hundreds or even thousands of breeding plants. However, just about any grower can manage to preserve some genetics by growing f2 seeds where they have crossed a male and female of the same strain, or can produce a simple cross which would be referred to as strain1xstrain2 for instance white widow crossed with ak-47 would be referred to as a WW x AK-47. You can produce some excellent seed and excellent marijuana this way.

To Feminise or not to Feminise

There are numerous myths surrounding feminized seeds. Feminizing seeds is a bit more work than simply crossing two plants naturally. However it will save you a lot of time in the end. If you make fem seeds properly then there is no increased chance of hermaphrodites and all seeds will be female. This means no wasted time and effort growing males and it means that all your viable seeds produce useful plants, since roughly half of normal seeds are male this effectively doubles the number of seeds you have.

Other times you will have no choice but to produce feminized seed because it will be a female plants genetics that you want to preserve and you won't have any males. Perhaps you recieved these genetics via clone or didn't keep males.

Selecting Suitable Parents

There are a number of important characteristics when selecting parents. First are you making fem seeds? If you are then both parents will be female. This makes things easier. If not then the best you can do is select a male with characteristics in common with the females you hope to achieve from the seed.

Obviously potency, yield, and psychoactive effects are critical to the selection process. But some other important traits are size, odor, taste, resistance to mold and contaminants, early finishing and consistency.

Collecting and Storing Pollen

In order to collect pollen you simply put down newspaper around the base of the plant. The pollen will fall from the plant onto the newspaper. You can then put this newspaper into a plastic bag and store it in the refrigerator or freeze it. Pollen will keep for a few months in the refrigerator and can be used on the next crop. The freezer will extend that to up to six months but gives the pollen a lower chance of viability that increases with time.

Pollinating a Plant

To pollinate a plant you can brush the pollen on a flower with a cotton swab or you can take the plastic bag and wrap the flower inside it and shake. In this way you can selectively pollinate plants and even individual buds and branches.

Male Isolation

A male plant or a plant with male flowers will pollinate your entire crop rendering it seedy. You probably don't want THAT many seeds so how can you avoid it? Moving the male to another room might work but if that other room shares an air path via ducting or air conditioning then pollen may still find its way. One technique is to construct a male isolation chamber.

A male isolation chamber is simply a transparent container such as a large plastic storage tub turned on its side (available at your local megamart). Get a good sized PC fan that can be powered with pretty much any 12v wall adapter, by splicing together the + (yellow or red on fan, usually dotted on power adapter) and the - wires (black on fan, usually dotted power adapter) just twist with the like wire on the other device and then seal up the connection with electric tape. Then take a filtrate filter and cut out squares that fit the back of the pc fan so that the fan pulls (rather than pushes) air through the filter. Tape several layers of filter to the back of the pc fan so all the air goes through the filter. Now cut a large hole in the top of the plastic container and mount the pc fan over top of it so it pulls air out the box. You can use silicon sealant, latex, whatever you've got that gives a good tight seal.

This can be used as is, or you can cut a small intake in the bottom to improve airflow. Pollen won't be able to escape the intake as long as the fan is moving but you might put filter paper over the intake to protect against fan failures. You can also use grommets to seal holes and run tubing into the chamber in order to water hydroponically from a reservoir outside the chamber. Otherwise you will need to remove the whole chamber to a safe location in order to water the plant or maintain a reservoir kept inside the chamber.

Making Feminised Seed

To make feminized seed you must induce male flowers in a female plant. There is all sorts of information on the internet about doing this with light stress (light interruptions during flowering) and other forms of stress. The best of the stress techniques is to simply keep the plant in the flowering stage well past ripeness and it will produce a flower.

Stress techniques will work but whatever genetic weakness caused the plants to produce a male flower under stress will be carried on to the seeds. This means the resulting seeds have a known tendency to produce hermaphrodites. Fortunately, environmental stress is not the only way to produce male flowers in a female plant.

The ideal way to produce feminized seed through hormonal alteration of the plant. By adding or inhibiting plant hormones you can cause the plant to produce male flowers. Because you did not select a plant that produces male flowers under stress there is no genetic predisposition to hermaphroditism in the seed vs plants bred between a male and female parent. There are actually a few ways to do this, the easiest I will list here.

Colloidal Silver (CS)

This is the least expensive and most privacy conscious way to produce fem seed. CS has gotten a bad name because there is so much bad information spread around about its production and concentrations. It doesn't help that there are those who believe in drinking low concentration colloidal silver for good health and there is information mixed in about how to produce that low concentration food grade product. Follow the information here and you will consistently produce effective CS and know how to apply it to get consistent results.

Simply construct a generator using a 9-12v power supply (DC output, if it says AC then its no good) that can deliver at least 250ma (most wall wart type power supplies work, batteries are not recommended since their output varies over time). The supply will have a positive and negative lead, attach silver to each lead (contrary to internet rumors, you aren't drinking this is cheap 925 silver is more than pure enough) you can expose the leads by clipping off the round plug at the end and splitting the wires, one will be positive and the other negative just like any old battery. Submerge both leads about 2-3 inchs apart in a glass of distilled water (roughly 8oz). Let this run for 8-24hrs (until the liquid reads 12-15ppm) and when you return the liquid will be a purple or silver hue and there may be some precipitate on the bottom.

This liquid is called colloidal silver. It is nothing more or less than fine particles of silver suspended in water so it is a completely natural solution and is safe to handle without any special precautions. The silver inhibits female flowering hormones in cannabis and so the result is that male flowering hormone dominates and male flowers are produced.

To use the silver, spray on a plant or branch every three days prior to switching the lights to 12/12 and continue spraying until you see the first male flowers. Repeated applications after the first flowers appear may result in more male flowers and therefore more pollen. As the plant matures it will produce pollen that can be collected and used to pollinate any female flower (including flowers on the same plant).

Silver Thiosulfate (STS)

Only mentioned for completeness. Silver Thiosulfate is more difficult to acquire and works on the same principle as CS. Its application is similar to CS and achieves the same results.

Gibberellic Acid (GA3)

This is probably the most popular way to produce feminized seed. GA3 can be purchased readily in powdered form, a quick search reveals numerous sources on ebay for as little as \$15. Simply add to water to reach 100ppm concentration and spray the plant daily for 10 days during flowering and male flowers will be produced.

Pests and Pest Control

Marijuana Cultivation/Pests and Pest Control

Pests and Pest Control

As you continue growing, you will sooner or later face pests. Pests are able to destroy all of the plants in your garden if they are in same room. Pests will find your indoor environment to be ideal and full of food, without any natural enemies.

It is good to know what pests appear, where a crop they can live and what are the typical symptoms. All the symptoms are not due to pests and can be caused nutrient maladjusted nutrients.

A magnifying glass and daily or at least regular inspection can save your garden from ruin. Often, pests are hiding on the underside of leaves. In order to get an accurate view of pests and their effects on your plants a magnifier of at least 8x magnification power will be required. The most important thing is to monitor your plants regularly.

For other plants fighting pests is easier but hemp does not respond well to chemical pesticides and chemical poisons would often render the output to be unsafe to consume or smoke. Biological pesticides are not toxic, so they can be used to remove pests. Neem oil is a natural and effective insecticide, which is produced from Neem tree seeds by squeezing. Pine soap solution is another natural pesticide, which is active against some pests. Pesticides containing pyrethrin can be used safely (pyrethrin is rapidly degradable organic insecticide). Before using any off the shelf pesticide you should make sure that the its use is recommended for fruits and vegetables. Any non-detergent soap can be mixed with water to make a natural pesticide, often ground red pepper or chilli powder is added as well to deter pests from returning. Soap based pesticides are effective against all soft bodied pests but because they kill on contact they must be applied with a great deal of care and do not on their own deter pests from returning. This is where the pepper additive comes in. If you have an aphid infestation then you should also consider taking steps to prevent ants from returning to your plants since it is the ants which farm the aphids.

Tetranychus urticae ^[1]

Spidermites are mostly orange-toned less than 0.5 mm long, spider animals. These should not occur if the humidity is above 50%. Vegetable mites are easy to identify because of their webs, but often it is already too late. If your hemp leaves are changing dirty yellow, and are starting to be falling, the plant may be infested with vegetable mites.

In order to prevent vegetable ticks its is best to examine plants a few days apart with a magnifying glass. They caused damage in the form of small dots on the leaves, these dots are caused by the mites sucking of plant juices from the underside of the leaves. Begin by looking at leaf bottoms, usually, these very small spider animals thrive there. Eggs are spherical white dots. If mites are many and they are able to weave web, they can be very

difficult to get rid of.

Vegetable mites thrive in a dry and warm environment, so the easiest of controlling is to increase air moisture. Hang wet towels in the rear of your space or mist regularly with water, especially below leafs. Keeping the temperature low will reduce their ability to reproduce. Unfortunately, vegetable mites remain alive even in cold temperatures and will resume activity when the temperature rises again.

If you find mites on any plant in your garden it may be best to remove it promptly to avoid infecting the other plants in the garden. Apply insecticide thoroughly with careful attention to the undersides of leaves. Raise humidity above 50 percent and only then return the plant to the garden. Monitor the plant carefully for a few days. Often simply misting with water and raising the ambient humidity is sufficient.

Collembola ^[2]

Coccidae ^[3]

Thysanoptera ^[4]

References

[1] http://en.wikipedia.org/wiki/Tetranychus_urticae

[2] <http://en.wikipedia.org/wiki/Collembola>

[3] <http://en.wikipedia.org/wiki/Coccidae>

[4] <http://en.wikipedia.org/wiki/Thysanoptera>

Common Plant Problems

Marijuana Cultivation/Common Plant Problems

Common Plant Problems

The problems that plague growers are myriad so it is difficult to say what the best approach is to this topic. Perhaps the best approach is to make this guide practical for troubleshooting purposes. To this end, you should first find the part of the plant or type of plant material that is showing a symptom that makes you think there is a problem. From there, find the listed symptom that best describes what you are seeing and you will hopefully find the problem and suggested fixes. This section is intended for troubleshooting and diagnosis. If you would like to familiarize yourself with the symptoms of the most common problems then skim seed issues, root issues, pH and water related leaf symptoms, stem issues, and problems with harvested marijuana.

Seed

Seeds are birth place of a new generation. A problem there will result in poor performance throughout the grow. The ideal seed is a dark green, almost brown and may have stripes or other markings, it is plump and firm. A slight pressure on the seed will not crush it. These things can make the difference between a small spindly plant and a vigorous healthy plant. A plump particularly ripe seed within a batch indicates improved fast growing genetics and a stronger seed that is more likely to survive to maturity.

Brittle/White Seed

If a slight pressure with your fingertip crushes seeds the seeds are not viable. They are immature. You should move along to other seeds, if you produced these seeds you need to be sure to pollinate the plant early in flowering and to let the seeds grow until they are starting to fall out naturally and are fully ripe and mature.

Green Seed

A green seed is simply immature. If the seed is firm and doesn't crush easily under a fingertip then it might still be saved if you do not have a dark viable seed to replace it (only use less than ideal seed if you can't avoid it). In order to save a green seed place it inside a damp paper towel in a dark warm place and check every few hours. The color of the seed will darken as it first ripens and it may eventually sprout. You should plant this seed very close to the surface if it sprouts since it may not have the nutrient stores that a fully mature seed would have. With the appropriate attention and care a green seed can achieve a plant with the full potential of the genetics.

Small Seed

Always choose the largest seeds you can but many plants simply do not produce large seeds. Some strains produce small seed exclusively.

Roots

Root are... well the root of the plant. Water, nutrients, and hormone supplements will likely be passed up from the roots into the plant proper. You need a strong, healthy, and plentiful root system to be able to pass enough nutrients and to support the plant at its maximum growth rate. Since the root structure isn't usually visible in addition to listing symptoms it is worth pointing out what roots need so you won't have these problems in the first place.

Tight Packed Roots, Curling Around the Edge of Container

This symptom is often accompanied by less than optimum growth. Your roots simply don't have enough room. Give them some more space by transplanting to a larger container disturbing the root ball as little as possible. Many people massage the bottom and sides of the root ball very gently just enough to untangle the tips but not so much as to actually break the root ball. If when transplanting you see that the roots did not take advantage of the container's horizontal space it means you didn't transplant often enough early on. You should transplant from smaller to larger container. For example, one hempy grow the ideal transplant path involved starting the clone in a small rockwool cube. When root tips were visible this was transplanted to a 16oz plastic cup. After a couple weeks this was transplanted to a half filled 2.5gal hempy bucket. A few days before flowering this was transplanted for the last time by lifting out of the bucket and filling halfway and then setting the complete root ball on top of the new grow medium so the roots could fill the entire bucket.

Sparse or Insubstantial Roots

This depends on your stage of growth. But generally speaking roots will grow well in a medium with a carefully maintained PH and lots of oxygen. This can be an early sign that you need more oxygenation. Perhaps this is caused by poor drainage in the soil (water pulls air into the pot from the top as it drains down the bottom) or perhaps you should add an air stone to your reservoir in a hydroponic system. Note that oxygen and not air is needed, it is possible to grow with your roots submersed in well oxygenated water all the time.

Slimy, Smelly Roots

Lack of oxygen has caused a condition known as root rot in which your roots have begun to rot. You can try to save this plant but you should remember that the impact on upon the results of your grow are going to be substantial and you should mentally chock it up as a learning experience at this stage. This will be accompanied by symptoms in the plant vegetable material as well.

In order to try to save the plant you should remove the plant from its container and remove all traces of rotted material from the roots the smell is very strong and will be unmistakable. Rinse the roots thoroughly with clean water and let them dry out. Replace your medium with fresh sterile medium and disinfect your container or use a new one. When the roots are dry transplant to the clean medium and clean container. Most importantly, you need to solve whatever is causing the root rot. If you need an airstone or an additional airstone then add one, remix your soil/medium for better drainage, or make

your flood and drain cycles less frequent.

Stems

Your stems are the trunks of your plant, or your leaf, or your flower. Each and every stem on the plant is important and is essential to the part it connects functioning correctly. People purchasing marijuana often complain about stems in ignorance. Stems contain within them a layer that transports nutrients and another soft pulp that transports water. Because of this stems are almost entirely composed of water weight and weight almost nothing when dried. For the best end result from your harvest, both in potency and quantity you will want nice strong thick stems.

Leaning Branches

If your branches are leaning down under the weight of your flowers the best thing you can do is tie up the branches. This can be partially avoided by installing a circulating fan in an indoor grow room to simulating the wind, the movement will cause your stems to strengthen.

Thin, Spindly Stalks

The most common cause of this symptom is lack of light. If plants are not getting enough light they will stretch to the light source so you probably need a bigger light and/or need to move it closer to the plants. Early on this can be partly solved by burying the plant more deeply when transplanting. Roots will eventually grow out of the newly submerged stem. You can also help with this condition by installing a circulating fan, the fan will simulate wind and the movement will strengthen stems. A weak root system may also contribute to this problem.

Broken Stem

This was probably caused by you trying to bend the plant to your will (literally). Its okay, don't panic the plant will probably be fine. Just tape the stem back together and support it by tying to a stake if needed to take the pressure off the break while this heals. The plant will heal itself and will have a knot where the break was located. You should allow your plant time to recover before stressing the location.

Leaves

The leaves of the plant are its solar panels and its lungs. Through its leaves the plant will absorb the power of the sun and utilize it in the process of photosynthesis. The leaves are your plant are usually the first to show signs that something is wrong. With a few exceptions damage to the leaf material will not recover after the problem is remedied and you should look to the new growth for signs the problem is resolved and the overall condition of the plant should show improvement. You will not find an exhaustive list of nutrient deficiencies here only the most common and easily identified if you need advanced deficiency identification you should try asking experienced growers either in person or via the Internet, if posting via the Internet they will need pictures to diagnose the plant with any degree of accuracy.

A common mistake is mistake a nutrient deficiency with a PH imbalance. A PH imbalance will cause your roots to be unable to take up nutrients and can even damage the roots. Anytime you see a possible nutrient imbalance such as yellowing, necrosis, or other signs of

plant damage you should double check your PH before adjusting nutrients.

Drooping Leaves

The most common causes of this symptom are over and under watering. If you are using a soil grow are you allowing the soil surface to get completely dry before watering again? You should be. If in a hydroponic grow you need to take measures to get oxygen to your roots. Otherwise, water your plant you probably got scared by all the sites telling you over-watering is the most common beginner mistake (which is true). In a soil grow you will want to fully saturate the pot with water when you water and then let the top inch or two of the soil dry out before drowning her again. As an added note, if you are using soil and it never seems to dry out then you may have purchased a bag of topsoil and not potting soil. This soil will not drain at all. You need a proper soil mix.

Broad Leaves with Edges Curled Down

This is a sign of excessive humidity. This usually won't harm the plant but less than optimal conditions result in a less than optimal growth and harvest. The width of the leaf is also determined by genetics so broad leaves alone are not a sure indicator of whether your environment is too humid.

Narrow Leaves with Edges Curled Up

This is a sign of low humidity. Like excess humidity this will not harm the plant but less than optimal conditions result in a less than optimal growth. Genetics again affect leaf broadness as well.

Yellowing of the Leaves (from the bottom of the plant upward)

This can be a sign of nitrogen deficiency or of over fertilization. If accompanied early by browning and necrosis of the leaf tips then you may be over fertilizing. Adding extra fertilizer when you are already over-fertilizing will kill a plant at any stage of growth so it is safer to flush the plant (if using a pot use three times as much water as your container size) with clean water to remove the excess nutrients. If this helps then excess nutrients are the problem. This could be because you are feeding the plant too much or if later in the growth cycle could be caused by excess nutrient salts building up in the soil. If this does not help then you may need to add more N to your fertilizer mix. These symptoms can also be caused by a PH imbalance.

It is worth mentioning that this symptom will also be seen late in flowering on many strains and is perfectly natural as the plant draws in nutrients from the leaves toward the end of its life. Some growers prefer to give extra nitrogen to slow or prevent this and others like to let nature take its course. Either will produce fine output.

Brown/Purple Spots and/or Dark Green Leaves on Stunted Plant

This is generally a sign of phosphorus deficiency. You may need to add more phosphorus to your water or you might have a PH imbalance.

Brown/Tan/Pale Spots Throughout Leaves

You may have a phosphorus deficiency or you may have contracted a pest. Refer to the section on pests for more information on detecting and removing a pest infestation.

Yellowing Between Leaf Veins

This is likely a potassium deficiency. Add to your water or correct a PH balance. Potassium can also be locked out by salt buildup so if your PH is correct you may try a flush before adjusting nutrients.

Older Leaves Yellow From the Center Outward, Leaf tips brown progressing inward, pale new growth

Look to trace element deficiency for these problems. Magnesium and Calcium are likely culprits. You can add a bit of dolomite lime to your water (1 tsp/gallon) or add a supplement such as cal-mag, or cal-max, or similar. As always with nutrient deficiency your problem may actually be a PH imbalance.

Leaves Turn Pale Yellow or White with Green Veins

This is a sign of iron deficiency. Add more trace nutrients or chelated iron. As always, PH imbalance could also be the culprit.

Flowers (while on growing plant)

It goes without saying that flowers are what it is all about. They are the only part of the plant that contains high enough concentrations of psychoactive compounds to be used without additional processing after drying. Flowers are also critical to seed production.

White Pistils Turn Purple/Red/Orange

This is not a problem and means you have done something right. It is common for pistils to change color if they are not pollinated.

Flowers are Stunted with Hard Bumps between Pistils

Your plant is likely pollinated. The bumps are seeds.

Internode Spacing is Wide and Buds are airy

This is probably caused by a wide variation between your daytime and nighttime temperature. If using lights indoor you can do a number of things to keep temperature under control. The simplest adjustment is to make sure your lights run at night when it is coolest and are off during the day.

White Fluffy or Powdery Coating on Buds

Don't mistake this with the sparkling trichomes crystals that will coat the flowers and the surrounding leaves in a fairly uniform manner. This is either mold or it looks wispy and weblike may be a pest. Either way it must be removed from your garden. If a pest refer to pest section but if its powdery mold remove it from your garden immediately. Do NOT smoke or eat moldy bud you could get sick or even die.

Buds Are Small

The buds are the cumulation of the entire grow and their size will reflect literally everything else. For big buds you need healthy roots to deliver lots of nutrients. You need to deliver proper nutrient levels. You need to supplement CO2 during flowering and have proper ventilation when not supplementing. You need to control temperatures. And you need to prune your plants properly, removing smaller growth with little potential so that your plants may concentrate on the main bud or buds.

Buds Aren't Sticky/Resinous

The flowers simply aren't ready yet. Let them go a little longer. An early finishing strain will take a full eight weeks of flowering and some strains will take twelve weeks. Give your plants the time they need to mature.

Harvested Flowers

Many people mistakenly believe that they are done when they harvest their flowers but in many ways the challenge is only started. Now you have a big pile of potentially usable bud and must treat and tend it to completion with out problems.

Crispy Crumbly Buds

You simply let your bud dry too much and probably too fast.

Pliable Stems with Dry Bud

There is likely more moisture on the inside. You would depending on just how dry to the bud itself is you could move on to the curing stage using a slow cure draw the moisture out from the center of the plant or let it dry longer before curing.

Powdery or Wispy Tendrils in Flowers

This is mold/mildew. You need to let your buds get more air. Do not try to save or smoke moldy bud. You could die.

Buds Smell and Taste Like Hay/Lawn

Characteristic of immature bud. This can often be partially solved with a long slow cure.

Buds Burn down to a Hard Black Ash

Too much phosphorus left in the plant during flowering. A slow dry and long cure will help. Next time do a proper flush before harvest.

Harsh Smoke

Proper slow drying and curing will give you a smooth smoke. Refer to the section covering this.

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OVERVIEW

There are few things in life as good as your own herb, grown by yourself at home out in the garden and indoors in pots... Oregano, Dill, Basil, Sage and other herbs are all easy to grow. Mint will take over the whole yard if you let it. Fresh mint and cilantro are incredible in salads and oriental dishes. But it all comes down to a truly motivational herb that is your friend and mine, a great healer and teacher to those that know it well.

Most people think of gardens as a seasonal, yearly project, but it's actually less time consuming and more rewarding to keep the garden going year round. If one were to attempt to grow year round, indoor gardening techniques will be needed at least during winter to keep the garden producing. You will have herb fresh at all times, there is no worry of mass storage through the winter and spring, it requires less space, and once established, requires only minimal attention every week to keep it producing at optimal levels.

The best part of being a gardener is it connects you to the earth. It connects you with nature, and is spiritually enriching. Try giving your plants energy by beaming good thoughts and energy at them every time you visit them. I find this helps me as much as it helps them; my plants seem to respond to it favorably.

GENETICS AND THE PLANT

It's very important to start with good genetics. You should attempt to find seeds from local gardeners that are acclimated and bred for local climate and best floral characteristics. Potency, aroma, fast growth, early maturation, resistance to fungus and pests are all factors that are considered by the seasoned gardener, and you will benefit enormously by finding a friend to get you started on the journey that never ends.

Attempt to find an Indica/Sativa hybrid if possible, as this will have the best high and good characteristics for indoor growth as well. Indica plants have a heavy, stony high that is tiresome, and sativas' are hard to grow indoors due to high light requirements, and late flowering traits, so a hybrid can be bred that will have the energetic, cerebral high of the sativa and the early maturation tendencies of the Indica plant. The Indica plant is easily recognized by its extremely broad leaves that are very rounded on the sides. The Sativa has very narrow, finger-like leaves. A hybrid will have qualities of both and have leaves that are a cross of these two types, thinner than an Indica, but much broader than a Sativa. It is possible to recognize a good hybrid by the leaves once you know what to look for. Look for seeds that are dark brown or light grey. Some may have dark lines inset into these colors, like tiger stripes. White, small seeds are immature and should not be planted.

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INDOORS & OUTDOORS - CONSTANT HARVEST STRATEGY

One of the best solutions to energy verses output for most home gardeners is to use outdoor light for flowering and use continuous light indoors for germination and vegetative growth. This will take advantage of the natural light/dark cycle and cut your energy use in half compared to the same operation indoors. A small greenhouse can be built of Filon fiberglass or PVC sheets that is innocuous and looks much like a storage shed or tool shed so it's not likely to raise suspicions.

In fact, a large shed of metal or plywood can be modified with a luminous roof of PVC, glass, fiberglass or plastic sheet, and some strains that do not require a great deal of light will grow well. Such a shed will discourage fly-by sightings and keep your business your own! It also allows you to keep out rats and gophers, keeps out the neighbor kids, and can be easily locked up. It will also give you an opportunity to actually plant in the ground if you desire, and this is the best way to avoid root-bound plants (if your not using hydroponics), and get bigger harvests.

In winter, indoor space is used to start new seedlings or cuttings to be placed outside in the spring, using natural sunlight to ripen the plants. This routine will provide at least 3 outdoor/greenhouse harvests per year. If more space is available to constantly be starting indoors and flowering 2nd harvest plants outdoors, harvests are possible every 60 days in many areas, with a small indoor harvest in the winter as a possibility as well.

The basic strategy of year round production is to understand the plant has two growth cycles. At germination the plant enters into a vegetative state and will be able to use all the continuous light you can give it. This means there is no dark cycle required. The plant will photosynthesis constantly and grow faster than it would outdoors with long evenings. Photosynthesis stops during dark periods and the plant uses sugars produced to build during the evening. This is not a requirement and the plant will grow faster at this stage with continuous photosynthesis (constant light). Once the plant is 12-18" tall, weather permitting, it can be forced to start flowering by placing it outside in the Spring or Fall. (For Summer outdoor flowering, the night must be artificially lengthened in the greenhouse to "force" the plants to flower. See FLOWERING chapter.)

Moving the plants to 10-13 hour light periods (moving it outside) with uninterrupted darkness (no bright lights nearby) will force the plant to flower. It will ripen and be 2-3' when ready to harvest. When a plant is moved from continuous indoor light to a 10-13 hour day outside, it will start to flower in anticipation of oncoming winter.

Vegetative starts moved outside March 1st, will be ripe by May 1. Vegetative starts moved outside on May 1 will be ripe by July 1. Starts moved outside Sept 1 are picked by Nov. 1st. In Winter, operations are moved indoors and a crop is planted for seed in anticipation of planting outdoors the next summer, or just for some extra winter stash. Keep in mind that the "man" is looking for plants in the Sept./Oct./Nov. time-frame, and may never notice plants placed outside to flower in April. Be smart, make your big harvest in May, not October!

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PLANTING INDOORS

A small indoor space should be found that can be used to germinate seeds; these vegetative starts are placed outside to mature in the spring after last freezes are over. The space can be a closet, a section of a bedroom, a basement area, an attic or unused bathroom. Some people devote entire bedrooms to growing. The space must be light leak proofed, so that no suspicious light is seen from outside the house. This could invite fuzz or rip-offs. The space should be vented. Opening the door of a closet can be enough ventilation if the space is not lit by big lights that generate a lot of heat. Separate exhaust and incoming air vents are best. One at the top of the room to exhaust air into the attic or out the roof, and one to bring in air from an outside wall or under-floor crawl space. Use fans from old computer cabinets, available from electronic liquidators for \$5 each. Dimmer switches can be used to regulate the speed/noise of the fans. Use silicon to secure the fans to 4-6" PVC pipe pushed through a round hole cut in the floor and ceilings. Use lots of silicon to damp the fans vibrations, so that the walls do not resonate to the fans' oscillations. Line the walls with aluminum foil, dull side out to diffuse the light and prevent hot-spots, or paint the walls bright white to reflect light. Aluminized Mylar, 1 mil thick is best.(\$20 for 25 feet of a 4' wide roll.) Mirrors are not good to use, since the glass eats light!

Line the floor with plastic in case of water spills, etc. Set up a voltage interrupt socket and be sure the electrical wiring will handle the lamps your going to use. Always place ballast's for HID lamps on a shelf, so they are above floor level, in case of water spills. Spacers placed on the floor under a ballast will work too. A shelf above the main grow area can be used to clone cuttings and germinate seedlings. It will allow you to double the area of your grow space and is an invaluable storage area for plant food, spray bottles and other gardening supplies. This area stays very warm, and no germination warming pad will be needed, so this arrangement saves you \$. Hang a light proof curtain to separate this shelf from the main area when used for flowering. This will allow constant lights on the shelf and dark periods in the main grow area. Velcro can be used to keep the curtain in place and ties can be used to roll it up when tending the garden. Black vinyl with white backing works best.

Now you need light. A couple of shop lights will be fine if you just want to start plants inside and then take them outside to grow in a small greenhouse. They can be purchased with bulbs for about \$10 each, or without bulbs for around \$8. Try to find them on sale. Use one Cool White and one Warm Light type bulb in each to get the best light spectrum possible for plant growth. Do not use expensive Grow-Lux type bulbs, as they do not put out as much light, and therefor do not work as well in most situations (go figure). If Cool White is all you can find, or afford, use them. They work fine, and are by far the cheapest.(About \$1-2 each.)

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SHELF GROWING

Shelf gardening with fluorescents may be the trend of the future, since the materials are so inexpensive, and easy to obtain. Fluorescent lamps are great for shelf gardening. In this system, many shelves can be placed, one above the other, and fluorescent lamps are used on each shelf. Some shelves have 24 hour lighting, some have 12 hour lighting (for flowering). Two areas are best, perhaps with one other devoted to cloning and germination of seed.

Shelf gardening assumes your going to keep all plants 3' or shorter at maturity, so all shelves are 3-4 feet apart. Less light is necessary when you have plants that are this short and forced to mature early.

One drawback to a shelf garden like this is that it is very time consuming to adjust the lamp height every day, and it is harder to take a vacation for even a week with no tending of the garden. This applies mostly to the vegetative stage, when plants are growing as much as an inch per day. Lamps on the flowering shelves are not adjusted nearly as often.

Normally, the lamps should be kept within 2 inches of the tops of the plants, with the plants arranged such that they get progressively taller as the end of the lamps go up, so that all plants are within this 2" range. This is an ideal however, and if you do go on vacation, adjust the lamps so that your sure the plants will not be able to grow up to the lamps within that length of time. If enough fluorescents are used to completely saturate the shelf with light, the spacing issue will not create spindly plants. They will merely grow a little slower if the lamps are not very close to them.

An alternative is to use fluorescent lamps for cloning, germination and early seedling growth on the top shelf of a closet, then switch over to HPS for heavy vegetative growth and/or flowering in the main closet area.

Position the HPS such that it won't need adjustment, at the top most possible point in the closet or room. Most HPS installations will not require lamp height adjustment. Just attach the lamp to the underside of shelf or ceiling as high as possible, and if you want to get a few plants closer to it, put them on a temporary shelf, box or table to get them closer to the lamp.

A shelf is all that is necessary with this type of setup, preferably at least 18" wide, up to about 24" maximum. This area must be painted a very bright white, or covered with aluminum foil, dull side out to reflect light back to the plants. (Dull side out prevents hot-spots; diffuses light better.) Paint the shelf white too. Or, use aluminized mylar, a space blanket, or any silvery surface material. Do not use mirrors, as the glass soaks up light.

Hang shop lamps from chains and make sure you can adjust them with hooks or some other type of mechanism so they can be kept as close to the plants as possible at all times (1-2"). If the lamps are too far from the plants, the plants could grow long, spindly stems trying to reach the lamp, and will not produce as much bud at maturity. This is due to internode length being much longer. This is the length of stem between each set of leaves. If it is shorter, there can be more internodes, thus more branches, thus a plant that provides more buds in less space at harvest time.

Shelf gardening is sometimes referred to as Sea of Green, because many plants are grown close together, creating a green canopy of tops that are grown and matured quickly, and the next crop is started and growing concurrently in a separate area of continuous light. Clones are raised in a constant light shelf, until they start to grow well vegetatively, then placed on a 12 hour per day shelf to flower.

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LIGHT

Indoors, 2000 lumens per sq. ft. is about as low as you want to go indoors. If you get under this mark, plant growth will certainly not go as fast as possible, and internode/stem length will increase. Also, light distance to plants will be much more critical. Daily adjustments to the lamps will be necessary, meaning you get no vacations. 2500 lumens psf should be a good target, and 3000 is optimal if your going to inject or enrich CO2 levels (more on that later).

High Intensity Discharge lamps are the best solution for most indoor growers. HID lamps come in 3 basic flavors: High Pressure Sodium (HPS), Metal Halide (MH) and Mercury Vapor. Metal Halide is an improved spectrum, higher intensity Mercury Vapor design. HPS is a yellowish sort of light, maybe a bit pink or orange. Same as some street lamps.

HPS lamps can be used to grow a crop from start to finish. Tests show that the HPS crop will mature 1 week later than a similar crop under MH, but it will be a bigger yield, so it's better to wait the extra week.

The easiest HID to buy, and least expensive initially are the fluorescent and mercury vapor lamps. MV will put out about 8000 lumens per 175 watts, and 150 watts of HPS puts out about 15k lumens, so HPS is almost twice as efficient. But the color spectrum from MV lamp output is not as good. HPS is high in reds, which works well for flowering, while the Metal Halide is rich in blues, needed for the best vegetative growth. Unfortunately, MV lamps provide the worst spectrum for plant growth, but are very inexpensive to purchase. They are not recommended, unless you find them free, and even then, the electricity/efficiency issues outweigh the initial costs saved.

400 watt HPS will output around 45k lumens. For every 500 watts of continuous use, you use about \$20 a month in electricity, so it is evident that a lamp taking half the power to output the same lumens (or twice the lumens at the same power level) will pay for itself in a year or so, and from then on, continuous savings will be reaped. This is a simple initial cost vs. operating costs calculation, and does not take into account the faster growth and increased yield the HPS lamp will give you, due to more light being available. If this is factored into the calculation the HPS lamp will pay for itself with the first crop, when compared to MV or fluorescent lamps, since it is easily twice as efficient and grows flowers faster and bigger.

Lamp Type	Watts	Lumens per bulb	Total efficiency
Fluorescent Bulb	40	3000	400 watts = 30k lumens
Mercury Vapor	175	8000	400 watts = 20k lumens
Metal Halide	400	36000	400 watts = 36k lumens
High P. Sodium	400	45000	400 watts = 45k lumens

Notice the Mercury Vapor lamps are less efficient than the fluorescent (FL), and can not be positioned as close to the plants, so the plants will not be able to use as much of the MV light. The light distribution is not as good either. MV lamps simply are not suitable for indoor gardening. Use fluorescent, MH, or HPS lamps only. Halogen arc lamps generate too much heat and not very much light for the wattage they use, and are also not recommended, even though the light spectrum is suitable for decent growth.

There is a new type of HPS lamp called Son Agro, and it is available in a 250, 1000, and 400 watt range. The 400 is actually 430 watts; they have added 30 watts of blue to this bulb. It is a very bright lamp (53k lumens) and is made for greenhouse use. These bulbs can be purchased to replace normal HPS bulbs, so they are an option if you already own a HPS lamp. The beauty of this bulb is that you do not give up most of the advantages of MH lamps, such as minimal internode spacing and early maturation, like most HPS users do, and you have all advantages of a HPS lamp. One bulb does it all. Internodal length of plants grown with the Son Agro are the shortest ever seen with any type of lamp. Plants grown under this lamp are incredibly bushy, compact and grow very fast. Son Agro bulbs however, do not last as long as normal HPS bulbs. There is something like a 25% difference in bulb life.

Metal Halide (MH) is another option, and is available in both a 36k and 40k lumen bulbs for the 400 watt size. The Super Bulb (40k) is about \$10-15 more, and provides an extra 4000 lumens. I think the Super Bulb may last longer; if so, that makes it the way to go. Halide light is more blue and better than straight HPS for vegetative growth, but is

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much less efficient than HPS. It is possible to purchase conversion bulbs for a MH lamp that convert it to HPS, but the cost of the conversion bulb is more expensive than the color corrected Son Agro bulb, so I would recommend just buying the Son Agro HPS. Even though it costs more initially, you get more for your energy dollar later, and it's much easier to hang than 10 fluorescent tubes. If you have a MH 36k lumen lamp burning at 400 watts and a 53k lumen HPS burning at 430 watts, which is better efficiency wise? Which will provide a better yield? Obviously, the Son Agro HPS, but of course, the initial cost is higher. Actually, the ballast will add about 10% to these wattage numbers. The Son Agro bulb will prove much better than the MH for any purpose. The MH bulb does not last as long, but is cheaper. Compare \$36 for a 400 watt MH bulb vs. \$40 for the HPS bulb. Add \$15 for the Son Agro HPS. The HPS bulb life is twice as long. 10k hours vs. 21k hours. The Son Agro is 16k hours or so. Still, longer bulb life and more light add up to more for your energy dollar long term.

Horizontal mounting of any HID is a good idea, as this will boost by 30% the amount of light that actually reaches the plants. Most HID's sold for indoor garden use these days are of this horizontal mounting arrangement.

HPS is much less expensive to operate than any other type of lamp, but comes in the 70 watt size at the home improvement stores. This size is not very efficient, but blows away FL in efficiency, so they might be an alternative to FL for very small operations, like 9 sq. feet or less. Over 9 sq. feet, you need more light than one of these lamps can provide, but you could use two of them. 70 watt HPS lamps cost about \$40 each, complete. Two lamps would be 140 watts putting out about 12k lumens, so it's better than FL, but a 150 watt HPS puts out about 18k lumens, the bulb life is longer, bulbs are cheaper and the lamp more efficient to operate. The biggest problem is that the mid size lamps like the 150 and 250 watt HPS are almost as expensive to buy as the larger 400's. For this reason, if you have room for the larger lamp, buy the 400. If your going pro, a 1080 watt model is available too, but you might find there is better light distribution from two 400's rather than one large lamp. Of course, the two smaller lamps are more expensive to purchase than one large lamp, so most people choose the larger lamp for bigger operations.

Heat buildup in the room is a factor with HID lamps, and just how much light the plants can use is determined by temperature, CO2 levels, nutrient availability, pH, and other factors. Too big of a lamp for a space will make constant venting necessary, and then there is no way to enrich CO2, since it's getting blown out of the room right away.

Bulb Costs: the bulb cost on the 70 watt HPS is \$24, the 150 is only \$30, and the 400 is only \$40. So you will spend more to replace two 70 watt bulbs than you will to replace one 400 watt HPS. (Go figure.) Add that up with the lower resale value on the 70's (practically nothing) and the fact that they are being modified and are not suited to this application, and it becomes evident that \$189 for a 250 HPS lamp, or \$219 for a 400, might just be worth the price. Keep in mind that for \$30 more, you can have the larger lamp (400watt) and it puts out 20k lumens more light than the smaller lamp. Not a bad deal!

Here is the breakdown on prices (from memory):

Type	Complete	Cost	Bulb	Cost	Bulb Life	Lumens
HPS	400	\$219	\$40		18k hours	50k
MH	400	\$175	\$37		10k hours	36k
Son Agro	400	\$235	\$55		15k hours	53k
Super MH	400	\$190	\$45		??	40k
MH	250	\$149	\$32		??	21k
HPS	250	\$165	\$36		??	27k
HPS agro	250	\$180	\$53		??	30k
MH	150	\$139	\$25		??	14k
HPS	175	\$150	\$30		??	17k

If your looking for these types of lamps, look in the Yellow Pages under gardening, nurseries, and lighting for indoor gardening stores in your area.

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SEA OF GREEN

Sea of Green (SOG) is the theory of harvesting lots of small plants, matured early to get the fastest production of buds available. Instead of growing a few plants for a longer period of time, in the same space many smaller plants are grown that mature faster and in less time. Thus, less time is required between crops. This is important to you when the electricity bill comes each month. One crop can be started while another is maturing, and a continuous harvest, year round can be maintained. 4 plants per square foot will be a good start for seedlings. 1 plant per square foot will allow plenty of room for each plant to grow a large top cola, but will not allow for much bottom branching. This is OK since indoors, these bottom branches are always shaded anyway, and will not grow very well unless given additional light and space. The indoor grower quickly realizes that plants that are too tall do not produce enough at the bottom to make the extra growing time used worth while. An exception to this rule would be if it is intended the plants are to go outside at some point, and it is expected that the light/shading issue will not be a factor at that point. The plants, if started at the same time, should create what is called a "green canopy" that traps most of the light at the top level of the plants. Little light will penetrate below this level, since the plants are so close together. The gardener is attempting to concentrate on the top of the plant, and use the light and space to the best advantage, in as little time as possible. Use of nylon poultry fence or similar trellising laid out over the green canopy will support the plants as they start to droop under the weight of heavy fruiting tops. Stakes can be used too, but are not as easy to install for plants in the middle and back of the room, where reach is more difficult.

It's easy to want big plants, since they will produce more yield per plant, but it's usually better with limited space to grow smaller plants that mature faster and pack into smaller spaces. Sea of Green was developed in Holland. Instead of fitting 4 large plants in that small room, fit 12 small ones on a shelf above 12 other small plants. These plants take only 3-4 months to mature from germination to ripe buds, and harvesting takes place constantly, since there is both a vegetative and flowering area devoted to each, with harvests every 45-60 days.

It's not the size of the plant, but the maturity and quality of the product that counts. Twice as many plants grown half as big will fill the grow space twice as fast, so harvests take place almost twice as often. Get good at picking early flowering plants, and propagate only those that are of the best quality. 6" square containers will allow for 4 plants per square foot. You may also gauge by the size of your growing tray (for passive hydroponics); I like kitty litter boxes. (\$3 each at Target) Planted 4 per square foot, (for vegetative seedlings) a 12 sq. ft. closet will hold 48 seedlings on one shelf. In my case, I use 4" rockwool cubes that fit into kitty litter pans @ 12 cubes per pan. I can get 5 pans onto a 12 sq. ft. closet upper shelf, so that is 60 seedlings on one small shelf!

For flowering indoors, 1 plant per sq. ft. is a good rule of thumb for SOG. If less plants are grown in this size space, it will take them longer to fill the space, thus more electricity and time will be used to create the same amount of product. If more than one plant p.s.f. is attempted, the grower will soon find that plants thus crowded tend to be more stem than bud, and the total harvest may be reduced, so be cautious. It's good to avoid "topping" your plants if you want them to grow as fast as possible. It's better just to grow 2 or 4 times more plants, since they will produce more, faster, in the same space. Also, "training" plants with twist-ties is a great way to get them to bush out a bit. Just take any type of plastic or paper twist tie and wrap it around the top of the plant, then pull it over until the top is bent over 90-180 degrees and then attach this to the main stem lower on the plant. Do this for one week and then release the plant from it's bond. The plant can be trained in this fashion to take less vertical space and to grow bushier, to fill the grow space and force lower limbs to grow upward and join the green canopy. This technique takes advantage of the fact that if the top is pulled over, it creates a hormonal condition in the plant that makes it bush out at all lower internodes. Sea of Green entails growing to harvest the main cola (top) of the plant. Bottom branches are trimmed to increase air flow under the "blanket" of growing tops. Use these cuttings for clones, as they are the easiest part of the plant to root. It's also the fastest part of the plant to regenerate after flowering has occurred.

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GERMINATION

Germinate seeds in sterile soil (for planting outdoors) or a hydroponic medium of rockwool or vermiculite. **DO NOT (!)** use a Jiffy cube #7 to germinate seeds. Informal tests and experience show these peat cubes do not work well and stunt the plants growth. Planting in vermiculite gives the seedling so much oxygen, and are so easy for roots to grow in, that the plants look large 1 week after germination! Keep them moist at all times, by placing seeds in vermiculite filled 16oz cups with holes in the bottom, placed in a tray of weak nutrient solution, high in P. Rockwool cubes also work extremely well. When the seed sprouts, place the rockwool cubes into larger rockwool cubes. No repotting or transplanting, and no soil mixing!

You can germinate seeds in a paper towel. This method is tricky; it's easy to ruin roots if they dry out, or are planted too late after germinating. Paper towels dry out **REAL FAST!** Place paper towel in a bowl, saturated with weak nutrient solution (not too much!), and cover with plastic wrap to keep it from drying out. Put bowl in a warm area; top of the gas stove, water heater closet, or above warm lamps. Cover with black paper to keep out light. Check every 12 hours and plant germinated seeds with the grow tip up (if possible) in a growing medium as soon as the root coming out of the seed is 1/16" or longer. Use tweezers, and don't touch the root tip. Transplant as little as possible by germinating in the same container you intend to grow the plant in for a significant period of time. Just plant in vermiculite or rockwool. You will be amazed at the results! 90% germination is common with this method, as compared to 50% or less with Jiffy Cubes. (Your mileage may vary.) 5-55-17 plant food such as Peter's Professional will stimulate root growth of the germinating seed and the new seedlings. Use a very dilute solution, in distilled water, about 1/3 normal strength, and keep temperatures between 72-80 degrees. Warm temperatures are very important. Many growers experience low germination rate if the temperatures are out of this range. A heating pad set to low or medium may be necessary, or a shelf constantly warmed by a light may do, but test it with a few seeds first, before devoting next years crop to it. No light is necessary and may slow germination. Cover germinating seeds with black paper to keep out light. Place seedlings in the light once they sprout.

Plan on transplanting only once or twice before harvest. Use the biggest containers possible for the space and number of seedlings you plan to start. Plants will suffer if continuously transplanted and delay harvesting. You will suffer too, from too much work! 13 2-liter plastic soda bottles filled with vermiculite/pearlite will fit in a cat box tray, and will not require transplanting for the first harvest, if you intend to grow hydroponically. Transplant them for a second regenerated harvest. Cut holes in the bottom of containers and fill the last few inches at the top with vermiculite only, to start seeds or accept seedling transplants. Since vermiculite holds water well, wicks water well, but does not hold too much water, roots always have lots of oxygen, even if they are sitting in a tray full of water. A hydrogen peroxide based plant food is used to get extra oxygen to the plants when the pans are kept continuously full. The water can be allowed to recede each time after watering, before new solution is added. This allows the plants roots to dry somewhat, and make sure they are getting enough oxygen. Use SuperSoil brand potting soil, as it is excellent and sterilized. If you insist on using dirt from the yard, sterilize it in the microwave or oven until it gets steamy (**NOT RECOMMENDED**). Sterilize the containers with a bleach solution, especially if they have been used a previous season for another plant.

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VEGETATIVE GROWTH

Once sprouted, the plant starts vegetative growth. This means the plant will be photosynthesizing as much as possible to grow tall and start many grow tips at each pair of leaves. A grow tip is the part that can be cloned or propagated asexually. They are located at the top of the plant, and every major internode. If you "top" the plant, it then has two grow tips at the top. If you top each of these, you will have 4 grow tips at the top of the plant. (Since it takes time for the plant to heal and recover from the trauma of being pruned, it's faster to grow 4 smaller plants and not top them at all. Or grow 2 plants, and "train" them to fill the same space. Most growers find)

All plants have a vegetative stage where they are growing as fast as possible after the plant first germinates from seed. It is possible to grow plants with no dark period, and increase the speed at which they grow by 15-30%. Plants can be grown vegetatively indefinitely. It is up to the gardener to decide when to force the plant to flower. A plant can grow from 12" to 12' before being forced to flower, so there is a lot of latitude here for each gardener to manage the garden based on goals and space available.

A solution of 20-20-20 with trace minerals is used for both hydroponic and soil gardening when growing continuously under lights. Miracle Grow Patio or RapidGrow plant food is good for this. A high P plant food such as Peter's 5-50-17 food is used for blooming and fruiting plants when beginning 12 hour days. Epsom salts (1tsp) should be used in the solution for magnesium and sulfur minerals. Trace minerals are needed too, if your food does not include them. Miracle Grow Patio includes these trace elements, and is highly recommended.

Keep lights on continuously for sprouts, since they require no darkness period like older plants. You will not need a timer unless you want to keep the lamps off during a certain time each day. Try to light the plants for 18 or more hours, or continuously at this point. Bend a young plant's stem back and forth to force it to be very thick and strong. Spindly stems can not support heavy flowering growth. An internal oscillating fan will reduce humidity on the leaf's stomata and improve the stem strength as well. The importance of internal air circulation can not be stressed enough. It will exercise the plants and make them grow stronger, while reducing many hazards that could ruin your crop.

HYDROPONIC VEGETATIVE SOLUTION, per gallon:

Miracle Grow Patio (contains trace elements) 1 teaspoon

Epsom salts 1/2 teaspoon

Human Urine (OPTIONAL - may create odors indoors.) 1/4 cup

Oxygen Plus Plant Food (OPTIONAL) 1 teaspoon

This mixture will insure your plants are getting all major and minor nutrients in solution, and will also be treating your plants with oxygen for good root growth, and potassium nitrate for good burning qualities. Another good GROWTH PHASE mix is 1/4 tsp. Peter's 20/20/20 fertilizer per gallon of water, with trace elements and oxygen added, or fish emulsion. Fish emulsion is great in the green-house or outdoors, where smells are not an issue, but is not recommended for indoors, due to its strong odor.

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FLOWERING

The plant will be induced to fruit or flower with dark cycles of 11-13 hours that simulate the oncoming winter in the fall as the days grow shorter. As a consequence, it works out well indoors to have two separate areas; one that is used for the initial vegetative state and one that is used for flowering and fruiting. There is no other requirement other than to keep the dark cycle for flowering very dark with no light interruptions, as this can stall flowering by days or weeks.

Once a plant is big enough to mature (12" or over), dark periods are required for most plants to flower and bear fruit. This will require putting the lamp on a timer, to create regular and strict dark periods of uninterrupted light. In the greenhouse, the same effect can be created in the Summer (long days) by covering it with a blanket to make longer night periods. A strict schedule of covering the plants at 8pm and uncovering them at 8am for 2 weeks will start your plants to flowering. After the first 2 weeks, the schedule can be relaxed a little, but it will still be necessary to continue this routine for the plants to completely flower without reverting back to vegetative growth.

Outdoors, Spring and Fall, the nights are sufficiently long to induce flowering at all times. Merely bring the plants from indoors to the outside at these times, and the plants will flower naturally. In late Summer, with Fall approaching, it may be necessary only to force flowering the first two weeks, then the rapidly lengthening nights will do the rest. Give flowering plants high P plant food and keep them on a strict light regimen of 12 hours, with no light, or no more than a full moon during the dark cycle. 13 hours light, 11 dark may increase flower size while still allowing the plant to go into the flowering mode. Use longer dark periods to speed maturity toward the end of the flowering cycle if speed is of the essence. (8-10 days) This will however, reduce total yield.

Two shelves can be used, one identical to the other, if strictly indoor gardening is desired. One shelf's lights are set for 12-13 hours, and one is lit continuously. Plants are started in continuous light, and are moved to the other shelf to flower to maturity after several weeks. This flowering shelf should be bigger than the "starting" or "vegetative" shelf, so that it can accommodate larger plants. Or, some plants can be taken outside if there is not enough space on the flowering shelf for all of them near harvesting.

A light tight curtain can be made from black vinyl, or other opaque material, with a reflective material on the other side to reflect light back to the plants. This curtain can be tied with cord when rolled up to work on the garden, and can be velcroed down in place to make sure no light leaks in or out. If the shelf is placed up high, it will not be very noticeable, and will fit in any room. Visitors will never notice it unless you point it out to them, since it is above eye level, and no light is being emitted from it.

Flowering plants like very high P level foods, such as 5-50-17, but 10-20-10 should be adequate. Nutrients should be provided with each watering when first flowering. Trace elements are necessary too; try to find foods that include these, so you don't have to use a separate trace element food too. Home improvement centers sell trace element solutions rich in iron for lawn deficiencies, and these can be adapted for use in cultivating the herb. Prices for these mass produced fertilizers are significantly cheaper than the specialized hydroponic fertilizers sold in indoor gardening shops, and seem to work just fine.

HYDROPONIC FLOWERING SOLUTION, per gallon:

1 tsp. high P plant food, such as 15-30-15, or 5-50-17, etc.

1/2 tsp. epsom salts

1 tsp. Oxygen Plus Plant Food (Optional)

1 tsp. Trace Element food

I cannot stress enough that during the FLOWERING PHASE, the dark period should not be violated by normal light. It delays flower development due to hormones in the plant that react to light. If you must work on the plants during this time, allow only as much light as a VERY pale moon can provide for less than 5 minutes. Keep pruning to a minimum during the entire FLOWERING PHASE.

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A green light can be used to work on the garden during the dark period with no negative reactions from the plants. These are sold as nursery safety lights, but any green bulb should be OK. It is best to keep the dark hours a time when you would normally not wish to visit the garden. Personally, I like my garden lit from 7pm to 7am, since it allows me to visit the garden at night after work and in the morning before work, and all day long, while I'm too busy to worry about it, it lies unlit and undisturbed, flowering away...

Flowering plants should not be sprayed often as this will promote mold and rot. Keep humidity levels down indoors when flowering, as this is the most delicate time for the plants in this regard.

Early flowering is noticed 1-2 weeks after turning back the lights to 12 hour days. Look for 2 white hairs emerging from a small bulbous area at every internode. This is the easiest way to verify females early on. You can not tell a male from a female by height, or bushiness.

3-6 weeks after turning back the lights, your plants will be covered with these white pistils emerging from every growtip on the plant. It will literally be covered with them. These are the mature flowers, as they continue to grow and cover the plant. Some plants will do this indefinitely until the lights are turned back yet again. At the point you feel your ready to see the existing flowers become ripe (you feel the plant has enough flowers), turn the lights back to 8-10 hours. Now the plant will start to ripen quickly, and should be ready to harvest in 2-3 weeks. The alternative, is to allow the plant to ripen with whatever natural day length is available outside, or keep the plants on a constant 12 hour regimen for the entire flowering process, which may increase yield, but takes longer.

Plants can be flowered in the final stages outdoors, even if the days are too long for normal flowering to occur. Once the plant has almost reached peak floral development, it is too far gone to revert quickly to vegetative growth, and final flowering will occur regardless. This will free up precious indoor space sooner, for the next batch of clones to be flowered.

Look for the white hairs to turn red, orange or brown, and the false seed pods (you did pull the males, right?) to swell with resins. When most of the pistils have turned color (~80%), the flowers are ripe to harvest.

Don't touch those buds! Touch only the large fan leaves if you want to inspect the buds, as the THC will come off on your fingers and reduce the overall yield if mishandled.

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HYDROPONICS

Most growers report that a hydroponic system will grow plants faster than a soil medium, given the same genetics and environmental conditions. This may be due to closer attention and more control of nutrients, and more access to oxygen. The plants can breathe easier, and therefore, take less time to grow. One report has it that plants started in soil matured after hydroponic plants started 2 weeks later! Fast growth allows for earlier maturation and shorter total growing time per crop. Also, with soil mixtures, plant growth tends to slow when the plants become root-bound. Hydroponics provides even, rapid growth with no pauses for transplant shock and eliminates the labor/materials of repotting if rockwool is used. (Highly recommended!)

By far the easiest hydroponic systems to use are the wick and reservoir systems. These are referred to as Passive Hydroponic methods, because they require no water distribution system on an active scale (pump, drain, flow meter and path). The basis of these systems is that water will wick to where you want it if the medium and conditions are correct. The wick system is more involved than the reservoir system, since the wicks must be cut and placed in the pots, correct holes must be cut in the pots, and a spacer must be created to place the plants up above the water reservoir below. This can be as simple as two buckets, one fit inside the other, or a kiddie pool with bricks in it that the pots rest on, elevating them out of the nutrient solution. I find the wick setup to be more work than the reservoir system. Initial setup is a pain with wicks, and the plants sit higher in the room, taking up precious vertical space. The base the pot sits on may not be very stable compared to a reservoir system, and a knocked over plant will never be the same as an untouched plant, due to stress and shock in recovery. The reservoir system needs only a good medium suited to the task, and a pan to sit a pot in. If rockwool slabs are used, a half slab of 12" rockwool fits perfectly into a kitty litter pan. The roots spread out in very desirable horizontal fashion and have a lot of room to grow. Plants grown in this manner are very robust because they get a great deal of oxygen at the roots. Plants grown with reservoir hydroponics grow at about the same rate as wicks or other active hydroponic methods, with much less effort required, since it is by far the simplest of hydroponic methods. Plants can be watered and feed by merely pouring solution into the reservoir every few days. The pans take up very little vertical space and are easy to handle and move around.

In a traditional hydroponic method, pots are filled with lava/ vermiculite mix of 4 to 1. Dolite Lime is added, one Tbs. per gallon of growing medium. This medium will wick and store water, but has excellent drainage and air storage capacity as well. It is however, not very reusable, as it is difficult to recapture and sterilize after harvest. Use small size lava, 3/8" pea size, and rinse the dust off it, over and over, until most of it is gone. Wet the vermiculite (dangerous dry, wear a mask) and mix into pots. Square pots hold more than round. Vermiculite will settle to bottom after repeated watering from the top, so only water from the top occasionally to leach any mineral deposits, and put more vermiculite on the top than the bottom. Punch holes in the bottom of the pots, and add water to the pan. It will be wicked up to the roots and the plants will have all they need to flourish. The reservoir is filled with 1 1/2 - 3 inches of water and allowed to recede between waterings. When possible, use less solution and water more often, to pull more oxygen to the roots faster over time. If you go away on vacation, simply fill the reservoirs full to the top, and the plants will be watered for 2 weeks at least. One really great hydroponic medium is Oasis floral foam. Stick lots of holes into it to open it up a little, and start plants/clones in it, moving the cube of foam to rockwool later for larger growth stages. Many prefer floral foam, as it is inert, and adds no PH factors. It's expensive though, and tends to crumble easily. I'm also not sure it's very reusable, but it seems to be a popular item at the indoor gardening centers. Planting can be made easier with hydroponic mediums that require little setup such as rockwool. Rockwool cubes can be reused several times, and are premade to use for hydroponics. Some advantages of rockwool are that it is impossible to over water and there is no transplanting. Just place the plant's cube on top of a larger rockwool cube and enjoy your extra leisure time. Some find it best to save money by not buying rockwool and spending time planting in soil or hydroponic mediums such as vermiculite/lava mix. Perlite is nice, since it is so light. Perlite can be used instead of or in addition to lava, which must be rinsed and is much heavier. But rockwool has many advantages that are not appreciated until you spend hours repotting; take a second look. It is not very expensive, and it is reusable. It's more stable than floral foam, which crunches and powders easily. Rockwool holds 10 times more water than soil, yet is impossible to over-water, because it always retains a high percentage of air. Best of all, there is

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no transplanting; just place a starter cube into a rockwool grow cube, and when the plant gets very large, place that cube on a rockwool slab. Since rockwool is easily reused over and over, the cost is divided by 3 or 4 crops, and ends up costing no more than vermiculite and lava, which is much more difficult to reclaim, sterilize and reuse (repot) when compared to rockwool. Vermiculite is also very dangerous when dry, and ends up getting in the carpet and into the air when you touch it (even wet), since it dries on the fingers and becomes airborne. For this reason, I do not recommend vermiculite indoors. Rockwool's disadvantages are relatively few. It is alkaline PH, so you must use something in the nutrient solution to make it acidic (5.5) so that it brings the rockwool down from 7.7, to 6.5 (vinegar works great.) And it is irritating to the skin when dry, but is not a problem when wet. To pre-treat rockwool for planting, soak it in a solution of fish emulsion, trace mineral solution and phosphoresic acid (PH Down) for 24 hours, then rinse. This will decrease the need for PH worries later on, as it buffers the rockwool PH to be fairly neutral.

Hydroponics should be used indoors or in greenhouses to speed the growth of plants, so you have more bud in less time. Hydroponics allows you to water the plants daily, and this will speed growth. The main difference between hydroponics and soil growing is that the hydroponic soil or "medium" is made to hold moisture, but drain well, so that there are no over-watering problems associated with continuous watering. Also, hydroponically grown plants do not derive nutrients from soil, but from the solution used to water the plants. Hydroponics reduces worries about mineral buildup in soil, and lack of oxygen to suffocating roots, so leaching is usually not necessary with hydroponics.

Hydroponics allows you to use smaller containers for the same given size plant, when compared to growing in soil. A 3/4 gallon pot can easily take a small hydroponically grown plant to maturity. This would be difficult to do in soil, since nutrients are soon used up and roots become cut-off from oxygen as they become root-bound in soil. This problem does not seem to occur nearly as quickly for hydroponic plants, since the roots can still take up nutrients from the constant solution feedings, and the medium passes on oxygen much more readily when the roots become bound in the small container. Plant food is administered with most waterings, and allows the gardener to strictly control what nutrients are available to the plants at the different stages of plant growth. Watering can be automated to some degree with simple and cheap drip system apparatus, so take advantage of this when possible.

Hydroponics will hasten growing time, so it takes less time to harvest after planting. It makes sense to use simple passive hydroponic techniques when possible. Hydroponics may not be desirable if your growing outdoors, unless you have a greenhouse.

CAUTION: it is necessary keep close watch of plants to be sure they are never allowed to dry too much when growing hydroponically, or roots will be damaged. If you will not be able to tend to the garden every day, be sure the pans are filled enough to last until next time you return, or you can easily lose your crop.

More traditional hydroponic methods (active) are not discussed here. I don't see any point in making it more difficult than it needs to be. It is necessary to change the solution every month if your circulating it with a pump, but the reservoir system does away with this problem. Just rinse the medium once a month or so to prevent salts build up by watering from the top of the pot or rockwool cube with pure water. Change plant foods often to avoid deficiencies in the plants. I recommend using 2 different plant foods for each phase of growth, or 4 foods total, to lessen chances of any type of deficiency. Change the solution more often if you notice the PH is going down quickly (too acid). Due to cationic exchange, solution will tend to get too acid over time, and this will cause nutrients to become unavailable to the plants. Check PH of the medium every time you water to be sure no PH issues are occurring. Algae will tend to grow on the medium with higher humidities in hydroponics. It will turn a slab of rockwool dark green. To prevent this, use the plastic cover the rockwool came in to cover rockwool slab tops, with holes cut for the plants to stick out of it. It's easy to cut a packaged slab of rockwool into two pieces, then cut the end of the plastic off each piece. You now have two pieces of slab, each covered with plastic except on the very ends. Now cut 2 or 3 4" square holes in the top to place cubes on it, and place each piece in a clean litter pan. Now your ready to treat the rockwool as described above in anticipation of planting. If growing in pots, a layer of gravel at the top of a pot may help reduce algae growth, since it will dry very quickly. Algae is merely messy and unsightly; it will not actually cause any complications with the plants.

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RECYCLING

Use pots made from squarish containers such as plastic water jugs, etc. More plants will fit in less space and have more rooting area if square containers are used. This makes your garden a recycling center, and saves you tons of money. 2-liter soda bottles work great, but are not square. 13 will fit in a kitty litter box, and these will take a 3 foot plant to maturity hydroponically. If you can get 4 litter boxes in a closet, you can grow 52 plants like this vegetatively. Spread them out more for flowering. Old buckets, plastic 3-5 gallon containers (food and paint industries, try painters' and restaurant dumpsters), paper paint buckets, old plastic garbage cans of all sizes, and garbage bags have all been used successfully by growers. Do not use paper milk cartons and juice cartons for reservoir hydroponics, since these are difficult to sterilize, and they introduce fungus into your reservoir trays. Inert materials, such as plastic is best. Be sure to sterilize all containers before each planting with a chlorine bleach solution of 2 tbsp. of bleach to one gallon of water. Let container and medium such as rockwool soak for several hours in the solution before rinsing thoroughly.

PLANTING OUTDOORS

Outdoor growing is the best. Outdoor pot by far is the strongest, since it gets more light, it's naturally more robust. No light leak problems. No dark periods that keep you out of your grow room. No electricity bills. Sunlight tends to reach more of the plant, if your growing in the direct sun. Unlike growing indoors, the bottom of the plant will be almost as developed as the top.

Outdoors, outside of a greenhouse, there are many factors that can kill your crop. Deer will try to eat them. Chipmunks and rodents too. Bugs will inhabit them, and the wind and rain can whip your little buds to pieces if they are exposed to strong storms. For this reason, indoor pot can be better than outdoor, but the best smoke I ever tasted was outdoor pot, so that tells you something; nothing beats the sun.

Put up a fence and make sure it stays up. Visit your plot at least once every two weeks, and preferably more often if water needs demand.

It's a good idea to use soil if you don't have a green house, since hydroponics will be less reliable outside in the open air, due mostly to evaporation.

Light exposure is all important when locating a site for a greenhouse or outdoor plot. A backyard grower will need to know where the sun shines for the longest period; privacy and other factors will enter in as well. Try to find an innocuous spot that gets full winter sun from mid morning to mid afternoon, at least from 10-4, preferably 8-5. This will be really asking for a lot if you live north of 30 degrees latitude since days are short in winter. Since most gardeners will not want to use the greenhouse in the middle of the winter, you can still use winter sun as an indicator of good spring and fall lighting exposures. Usually the south side of a hill gets the most sun. Also, large areas open to the sun on the north side of the property will get good southern exposures. East and West exposures can be good if they get the full morning/afternoon sun and mid-day sun as well. Some books say the plants respond better to morning-only sun, versus afternoon-only sun, so if you have to choose between the two, morning sun may be better. Disguise your greenhouse as a tool shed, or similar structure, by using only one wall and a roof of white opaqued plastic, PVC, Filon, or glass, and using a similar colored material for the rest of the shed, or painting it white or silvery, to look like metal. Try to make it appear as if it has always been there, with plants and trees that grow around it and mask it from view while allowing sun to reach it.

Filon (corrugated fiberglass) or PVC plastic sheets can be used outside to cover young plants grown together in a garden. Buy the clear greenhouse sheets, and opaque them with white wash (made from lime) or epoxy resin tinted white or grey and painted on in a thin layer. This will pass more sun than white PVC or Filon, and still hide the plants. Epoxy resin coats will preserve the Filon for many more seasons than it would otherwise last. It will also allow you to disguise the shed as metal, if you paint the clear filon sheets with a thin layer of resin tinted light grey. Paint will work as well, but may not protect as much. Be careful to use only as much as needed, to reduce sun blockage to a minimum.

Dig a big hole, don't depend on the plant to be able to penetrate the clay and rubble unless your sure of the quality of topsoil in the area. Grassy fields would have good top soil, but your back yard may not. This alone can make the difference between an average 5' tall plant, and a 10' monster by harvest time. Growing in the ground will always

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beat a pot, since the plant will never become root bound in the ground. Plants grown in the ground should grow much larger, but will need more space for each plant, so plan accordingly, you can't move them once they're in!

You may want to keep outdoor plants in pots so they can be easily moved. A big hole will allow the pot to be placed in it, thus reducing the height of the plant, if fence level is an issue. Many growers find pots have saved a crop that had to be moved for some unexpected reason (repairman, appraiser, fire, etc.).

It's always best to put a roof over your plants outdoors. When I was a lad, we had plants growing over the fence line in the back yard. We started to build a greenhouse roof for them, and a cop saw us hauling wood, thought we were stealing it (which we were not) and looked over the fence at us and our lovely plants. We were busted, because he saw them. If he had seen a shed roof instead, there would never have been a problem. Moral of the Story: build the roof BEFORE the plants are sticking over the fence! Or train them to stay well below it. Live and learn...

When growing away from the house, in the wild, water is the biggest determining factor, after security. Water must be close by, or close to the soil surface, or you will have to pack water in. Water is heavy and this is very hard work.

Try to find an area close to a source of water if possible, and keep a bucket nearby to carry water to your plot.

A novel idea in this regard is to find high water in the mountains, at altitude, and then route it down to a lower spot close by. It is possible to create water pressure in a hose this way, and route it to a drip system that feeds water to your plants continuously. Take a 5 gallon gas can, and punch small holes in it. Run a hose out of the main orifice and secure it somehow. Bury the can in a river or stream under rocks, so that it is hidden and submerged. Bury the hose coming out of it, and run it down hill to your garden area. A little engineering can save you a lot of work, and this rig can be used year after year.

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GUERRILLA FARMING

Guerrilla farming refers to farming away from your own property, or in a remote location of your property where people seldom roam around. It is possible to find locations that for one reason or another are not easily accessible or are privately owned. Try to grow off your property, on adjacent property, so that if your plot is found, it will not be traceable back to you. If it's not on your property, nobody has witnessed you there, and there is no physical evidence of your presence (footprints, fingerprints, trails, hair, etc.), then it is virtually impossible to prosecute you for it, even if the cops think they know who it belongs to. Never admit to growing, to anyone. Your best defense is that you'r just passing through the area, and noticed something you decided to take a look at, or carry a fishing pole or binoculars and claim fishing or bird watching. Never tell anyone but a partner where the plants are located. Do not bring visitors to see them, unless it is harvest time, and the plants will be pulled the same or following day. Make sure your plants are out of sight. Take a different route to get to them if they are not in a secure part of your property, and cover the trail to make it look as if there is no trail. Make cut backs in the trail, so that people on the main trail will tend to miss the cut-back to the grow area. Don't park on the main road, always find a place to park that will not arouse suspicion by people that pass on the road. Have a safe house in the area if you are not planting close to home. Always have a good reason for being in the area and have the necessary items to make your claim believable. Briar and poison oak patches are perfect if you can cut through it. Poison Oak must be washed away before an allergic reaction takes place. Teknu is a special soap solution that will deactivate poison oak before it has time to create a reaction. Apply Teknu immediately after contact and take a shower 30 min. later. Try to plant under trees, next to bushes and keep only a few plants in any one spot. Train or top the plants to grow sideways, or do something to prevent the classic Christmas tree look of most plants left to grow untrained. Tying the top down to the ground will make the plants branches grow up toward the sun, and increase yield, given a long enough growing season. Plants can be grown under trees if the sun comes in at an angle and lights the area for several hours every day. Plants should get at least 5 hours of direct sun every day, and 5 more hours of indirect light. Use shoes that you can dispose of later and cover your foot prints. Use surgical gloves and leave no fingerprints on pots and other items that might ID you to the fuzz...in case your plot is discovered by passers by. Put up a fence, or the chipmunks, squirrels and deer will nibble on your babies until there is nothing left. Green wire mesh and nylon chicken fencing net work great and can be wrapped around trees to create a strong barrier. Always check it and repair every visit you make to the garden. A barrier of fishing line, one at 18" and another at 3' will keep most deer away from your crop. Gopher Granola is available for areas such as the N. CA mountains, where wood rats and gophers will eat your crop if given any opportunity to do so. The best fence in the world will not keep rats away from your plants! Do not use soap to keep deer away, it will attract rats! (The fat in the soap is edible for them.) Put the poison grain in a feeder than only small rodents can enter, so that birds and deer can't eat it. Set out poison early, before actual planting. The rats must eat the grain for several days before it will have any effect on them. Ultimately, you may find it's easier to grow in a greenhouse shed in your own backyard rather than try to keep the rats from eating your outdoor plot.

When growing away from the house, in the wild, water is the biggest determining factor, after security. The amount you can grow is directly proportional to the water available. If you must pack-in water, carry it in a backpack in case your seen in-route to your garden; you will appear to be merely a hiker, not a grower.

Transporting vegetative starts to the growing area is a most tricky aspect of growing outdoors. Usually, you will want to start plant indoors, or outside in your garden, then transport them to the grow site once they are firmly established. It may be desirable to first detect and separate males from females so that no effort of transporting, transplanting, or watering the males is incurred. One suggestion is to use 3" rockwool cubes to start seedlings in, then put 20 of them in a litter pan, cover it with another pan, and transport this to the grow site. The cubes can be planted directly into soil. If spotted enroute to the grow area, burying a dead cat may be a good excuse for being in the area. Few people would demand to see the rotting corpse! One outdoor grower we know has given up on seeds. He has several strains he likes to clone, so he starts 200 clones in his closet, then transports them outdoors in boxes to the grow site. No males, no differentiation, no weeding, no germinating seeds, no genetic uncertainties, no crops grown for seed, no transporting/transplanting/watering plants your just going to pull up later, no pollination nightmares, no wasted effort!

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SOIL GROWING

Use Super Soil brand in California, as this is the only known soil on the West Coast that is guaranteed to be good. Many other brands are mostly wood products and have very few nutrients, are too moist, etc. Add vermiculite, perlite or sand to Super Soil to increase its drainage and aeration. Organic gardeners use their own compost prepared from a mixture of chicken, cow or other manure and household food waste, leaves, lawn clippings, dog hair and other waste products including urine, which is high in nitrogen. Dog hair is not recommended for guerilla gardeners planting off their property where police could find it. DNA tests could prove it was YOUR dog's hair! Use P4 water crystals in the soil to give the plants a few days worth of emergency water reserves. This substance swells up with water and holds it like a sponge, so that roots will have a reserve if harsh drought makes constant watering necessary. Go real easy on this stuff though, it tends to sink to the bottom of the pot and suffocate bottom roots (new growth roots) and stunts the plant. Use in extreme moderation, let it swell up for at least an hour before mixing with other soil. Plant size in soil is directly related to pot size. If you want the plant to grow bigger, put it in a bigger pot. Usually, 1/2 gallon per foot of plant is sufficient. A six foot plant would require a minimum of a 3 gallon pot. Remember, square containers have more volume in a square space (like a closet). Planting in the ground is always preferable when growing in soil. The plants can then grow to any size, unlimited by pot size. Bat Guano, chicken manure, or worm castings can all be used to fertilize organically in soil. Manures can burn, so they should be composted with the soil first, before planting, over several weeks. Sea weed is available to provide a rich trace mineral source that breaks down slowly and constantly feeds the plants. If growing outdoors in available soil, look around for leaves and other natural sources of nitrogen and work them into the soil, along with some dolomite lime and composted organic fertilizer. Even small amounts of plant food such as Miracle Grow can be added to soil at this time. (Organic gardeners frown upon this practice, however. Toxic wastes are produced by commercial fertilizer production.) Mulch can be made from leaves and spread out over the garden area to hold in moisture and keep down weeds near the plants.

SECURITY

Its interesting that pot plants really do blend in with other plants to the point that they are unidentifiable by all but the most observant. I remember a relative of the family on a visit to Texas showed me his corn in the garden and I was standing 3' away from several pot plants before I recognized them for what they were.

Plants started outdoors late in the season never get very big and never attract the least bit of attention when placed next to plants of similar or taller stature. Even tall plants grown among several trees will be almost invisible in their camouflage.

Outdoors the object is to control access to an area, and not to arouse suspicion. Tuck them here and there, never in a recognizable pattern. Space them out, and fit them in to the existing landscape such that they get full sun, but they're hidden or blend in. Fence lines and groups of several together are best. Try to find strains that seem to match the surrounding plants. Feed nitrogen to your plants if they need to be greener to blend in. Some growers even use plastic red flowers, pinned to a plant, disguising it as a flower bush.

Visit the plants at night on full moons, and if you're visible to neighbors, appear to be pruning a tree, mowing the lawn, or doing something in the yard that makes you invisible.

Dig a hole and put a potted plant in it. The plant's height will be reduced by at least a foot.

Some growers top the plant when it is 12" high, and grow the 2 tops horizontally along a trellis. The plant will never be over 3 feet tall, and never arouses suspicion from neighbors. This type of plant can even be grown in your yard in full view. Many stories abound of having the neighbors over for a BBQ and nobody ever noticed the nice plants over by the fence...

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PLANT FOOD AND NUTRIENTS

Plant foods have 3 main ingredients that will be the mainstay of the garden, Nitrogen, Phosphorus, and Potassium. These 3 ingredients are usually listed on the front label of the plant food in the order of N-P-K. A 20-20-20 plant food has a Nitrogen level of 20%. Secondary nutrients are Calcium, Sulfur and Magnesium. In trace quantities, boron, copper, molybdenum, zinc, iron, and manganese.

Depending on stage of growth, different nutrients are needed at different times. For rooting and germination, levels of high P nutrients with less N/K are needed. Vegetative growth needs lots of N, and human urine is one of the better sources, (mix 8 ounces to 1 gallon water), although it is not a complete fertilizer unto itself. 20-20-20 with trace elements should do it; I like Miracle Grow Patio food. Watch for calcium, magnesium, sulfur and iron levels too. These are important. One tablespoon of dolomite or hydrated lime is used per gallon of growing medium when a hydroponic medium is first brought on-line, to provide nitrogen, calcium and magnesium. Epsom salts are used to enhance magnesium and sulfur levels in solution. Tobacco grown with potassium nitrate burns better. Plant foods with PN (P2N3) are foods such as Miracle Grow. This is an excellent fertilizer for vegetative growth, or through the flowering cycle as well. Consider however, potassium nitrate is also known as Salt Peter, and is used to make men have less sexual desire or impotent, such as in mental institutions. So if certain plants are destined for cooking, you might use Fish Emulsion or some other totally organic fertilizer on these plants, at least in the last weeks of flowering. Most hydroponic solutions should be in the range of 150-600 parts per million in dissolved solids. 300-400 PPM is optimum. It is possible to test your solution or soil with a electrical conductivity meter if your unsure of what your giving your plants. Keep in mind most dissolved solids readings are usually on the low side, and actual nutrient levels are usually higher. It is possible with passive hydroponics, to get nutrient build-up over several feedings, to the point the medium is over saturated in nutrients. Just feed straight water now and again, until you notice the plants are not as green (slightly), then resume normal feeding. "Pumping" is when you use more waterings to make the plants grow faster. This is dangerous if you proceed in a reckless manner, due to potential over-watering problems. You must go slowly and watch the plants daily and even hourly at first to be sure your not over-watering the plants. Use weaker plant food mixtures than normal, maybe 25%, and be sure your leaching once a month and running straight water through the plants at least every other time you water. This applies mainly to plants grown in soil mediums. Use of light strength Oxygen Plus plant food (or Food Grade Hydrogen Peroxide) allows the roots to breath better and prevents problems with over-watering. Check soil to be sure there are no PH anomalies that might be due to Hydrogen Peroxide in the solution. (One experienced grower told me he would not use H2O2 (HP) due to possible PH problems. This should not be a problem if your checking PH and correcting for it in watering solutions.) Be sure your medium has good drainage. At this point, if your watering soil based plants once a week, you can water every 3-5 days instead if you plant them in a medium with better drainage. Perlite or lava rock will greatly increase the drainage of the medium and make watering necessary more often. This will pump the plants; they will tend to grow faster because of the enhanced oxygen to the roots. Make sure the plant medium is almost dry before watering again, as the plant grows faster this way.

An alternative is to use a standard plant food mixture (stronger) once every 3 waterings. The nutrients are suspended in the medium and stored in the soil for later use. The nutrients are washed out by 2 straight waterings afterward and there is no salts build up in the soil. (Does not apply to hydroponics.) Stop all plant food 2 weeks before harvesting, so that the plants don't taste like plant food. (This applies to hydroponics as well.)

WARNING: Do not over-fertilize. It will kill your plants. Always read the instructions for the fertilizer being used. Use 1/2 strength if adding to the water for all feedings in soil or hydroponics if you are unsure of what your plants can take. Build up slowly to higher concentrations of food over time. Novice soil growers tend to over-fertilize their plants. Mineral salts build up over time to higher levels of dissolved solids. Use straight water for one feeding in hydroponics if it is believed the buildup is getting too great. Leach plants in pots every month. If your plants look REALLY green, withhold food for a while to be sure they are not being over-fed.

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PH AND FERTILIZERS

PH can make or break your nutrient solution. 6.7-6.2 is best to ensure there is no nutrient lock-up occurring.

Hydroponics requires the solution to be PH corrected for the medium before exposing to the plants. Phosphoric acid can make the PH go down; lime or potash can take it up when it gets too acid. Buy a PH meter for \$10 and use it in soil, water, and hydroponic medium to make sure your not going alkaline or acid over time. Most neutral mediums can use a little vinegar to make them just this side of 7 pH to 6.5 or so.

Most fertilizers cause a pH change in the soil. Adding fertilizer to the soil almost always results in a more acidic pH. As time goes on, the amount of salts produced by the breakdown of fertilizers in the soil causes the soil to become increasingly acidic and eventually the concentration of these salts in the soil will stunt the plant and cause browning out of the foliage. Also, as the plant gets older its roots become less effective in bringing food to the leaves. To avoid the accumulation of these salts in your soil and to ensure that your plant is getting all of the food it needs you can begin leaf feeding your plant at the age of about 1.5 months. Dissolve the fertilizer in worm water and spray the mixture directly onto the foliage. The leaves absorb the fertilizer into their veins. If you want to continue to put fertilizer into the soil as well as leaf feeding, be sure not to overdose your plants.

FOLAIR FEEDING

Folair feeding seems to be one of the easiest ways of increasing yield, growth speed, and quality in a well vented space, with or without elevated CO2 levels. Just prepare a tea of worm castings, fish emulsion, bat guano, or most any other plant food right for the job and feed in vegetative and early flowering stages. It is not recommended for late flowering, or you will be eating the sprayed-on material later. Stop Folair feeding 2-3 weeks before harvesting. Wash off the leaves with straight water every week to prevent clogging the stomata of the leaves. Feed daily or every other day. Best times of day to Folair feed are 7-10Am and after 5 in the evening. This is because the stomata on the underside of the leaves are open then. Also, the best temperature is about 72 degrees, and over 80, they may not be open at all. So find the cooler part of the day if it's hot, and the warmer part of the day if it's cold out. You may need to spray at 2AM if that's the coolest time available. The sprayer used should atomize the solution to a very fine mist; find your best sprayer and use it for this. Make sure the PH is between 7 and 6.2. Use baking soda to make the solution higher PH, and vinegar to make the solution lower PH. It's better to spray more often and use less, than to drench the plants infrequently. Use a wetting agent to prevent the water from beading up, and thereby burning the leaves as they act as small prisms. Make sure you don't spray a hot bulb; better yet, spray only when the bulb has cooled. Perhaps the best Folair feeding includes using seltzer water and plant food at the same time. This way, CO2 and nutrients are feed directly to the leaves in the same spray. Folair feeding is recognized in most of the literature as being a good way to get nutrients to the plant later when nutrient lockup problems could start to reduce intake from the roots.

WARNING!: It is important to wash leaves that are harvested before they are dried, if you intend to eat them, since they may have nitrate salts on them.

NOTE: One grower who reviewed this document comments: "Fish emulsion smells. Bat guano could be highly unsanitary. Stick to the Rapid-Gro, MgSO4 (Epsom salts), hydroponic trace element solution. Nitrate salts (The "N" in NPK) are unhealthy to smoke. Personally, I never Folair feed." Personally, I use only CO2 on my indoor hydroponic plants, and never Folair feed. It simply does not seem to be necessary when using hydroponics.

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CO2

Elevating carbon dioxide levels can increase growth speed a great deal, perhaps even double it. It seems that the plant evolved in primordial times when natural CO2 levels were many times what they are today. The plant uses CO2 for photosynthesis to create sugars it uses to build plant tissues. Elevating the CO2 level will increase the plants ability to manufacture these sugars and plant growth rate is enhanced considerably. CO2 can be a pain to manufacture safely, cheaply, and/or conveniently, and is expensive to set up if you use a CO2 tank system. CO2 is most usable for flowering, as this is when the plant is most dense and has the hardest time circulating air around its leaves. If your strictly growing vegetatively indoors, (transferring your plants outdoors to flower), then CO2 will not be a major concern unless you have a sealed greenhouse, closet or bedroom, and wish to increase yield and decrease flowering time. For a medium sized indoor operation, one approach is to use CO2 canisters from welding supply houses. This is expensive initially, but fairly inexpensive in the long run. These systems are good only if your area is not too big or too small.

The basic CO2 tank system looks like this:

- 20 lb. tank \$100
- Regulator \$159
- Timer or controller \$10-125
- Fill up \$15-20

Worst case = \$395 for CO2 tank setup synced to a exhaust fan with a thermostat.

CO2 is cheaply produced by burning Natural Gas. However, heat and Carbon Monoxide must be vented to the outside air. CO2 can be obtained by buying or leasing cylinders from local welding supply houses. If asked, you can say you have an old mig welder at home and need to patch up the lawnmower (trailer, car, etc.)

For a small closet, one tank could last 2 months, but it depends on how much is released, how often the room is vented, hours of light cycle, room leaks, enrichment levels and dispersion methods. This method may be overkill for your small closet. It is generally viewed as good to have a small constant flow of CO2 over the plants at all times the lights are on, dispersed directly over the plants during the time exhaust fans are off. Opportunities exist to conserve CO2, but this can cost money. When the light is off you don't need CO2, so during flowering, you will use half as much if you have the CO2 solenoid setup to your light timer. When the fan is on for venting, CO2 is shut off as well. This may be up to half the time the light is on, so this will affect the plants exposure times and amount of gas actually dispensed. Environmentally, using bottled gas is better, since manufacturing it adds to greenhouse effect, and bottled CO2 is captured as part of the manufacturing process of many materials, and then recycled. Fermenting, CO2 generators, and baking soda and vinegar methods all generate new CO2 and add to greenhouse effect. CO2 generation from fermentation and generators is possible. A simple CO2 generator would be a propane heater. This will work well, as long as the gases can be vented to the grow area, and a fan is used to keep the hot CO2 (that will rise) circulating and available below at the plants level. Fire and exhaust venting of the heat are issues as well. A room that must be vented 50% of the time to rid the environment of heat from a lamp and heater will not receive as much CO2 as a room that can be kept unvented for hours at a time. However, CO2 generators are the only way to go for large operations.

Fermentation or vinegar over baking soda will work if you don't have many vent cycles, but if you have enough heat to make constant or regular venting necessary, these methods become impractical. Just pour the vinegar on baking soda and close the door, (you lose your CO2 as soon as the vent comes on). This method leaves a great deal to be desired, since it is not easy to regulate automatically, and requires daily attention. It is possible however, to create CO2 by fermentation, let the wine turn to vinegar, and pour this on baking soda. It's the most cost-effective setup for most closet growers, for whom \$400 in CO2 equipment is a bit much to swallow.

In fermentation, yeast is constantly killing itself; it takes a lot of space. You need a big bin to constantly keep adding water to, so that the alcohol levels will not rise high enough to kill the yeast. Sugar is used quickly this way, and a 10 pound sack will run \$3.50 or so and last about 2-3 weeks. This is also difficult to gauge what is happening as far as

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amounts actually released. A tube out the top going into a jar of water will bubble and demonstrate the amount of CO₂ being produced. Try sodium bicarbonate mixed with vinegar, 1 tsp.: ~30cc- this will gush up all frothy as it releases CO₂. do it just before you close the door on your plants. A MUCH cheaper way to provide CO₂ is 2 Oz sugar in 2 liters of water in a bottle [sterilized 1st with bleach and water, then rinsed], plus a few cc urine[!] or if you insist, yeast nutrient from a home brewing supplier. Add a brewing yeast, shake up and keep at 25 deg Celsius (~70 F) . Over the next 2 weeks or so it will brew up about 1/2 Oz CO₂ for every Oz sugar used. Keep a few going at once, starting a new one every 3 days or so. With added CO₂ growth is phenomenal!!! I personally measured 38cm growth in 8 days under a 250watt HPS bulb[tubular clear, Horizontal mount. A good container is a 1 gallon plastic milk jug, with a pin-hole in the cap. Also, the air-lock from a piece of clear tube running into a jar filled with water will keep microbes out and demonstrate the fermentation is working. A variation is to spray seltzer water on the plants twice a day. This is not recommended by some authorities, and receives great raves by people who seem to feel it has enhanced their crop. It stands to reason this would work for only a small unvented closet, but may be right for some situations. It could get expensive with a lot of plants to spray. Use seltzer, not club soda, since it contains less sodium that could clog the plants stomata. Wash your plants with straight water after 2 or 3 seltzer sprays. It's a lot of work, and you can't automate it, but maybe that's good! Remember, being with the plants is a beautiful experience, and brings you closer to your spiritual self and the earth. Seltzer is available at most grocery stores (I get it at Lucky's @ .79 for a 2 liter bottle). Club soda will work if seltzer water is not available; but it has twice as much sodium in it. A very diluted solution of Miracle Grow can be sprayed on the plant at the same time. One factor of using seltzer water is it raises humidity levels. Make sure your venting humidity during the dark cycle, or you could risk fungus and increased internode length.

CAUTION: Don't spray too close to a hot bulb! Spray downward only, or turn off the lamp first. Even though CO₂ enrichment can mean 30-100% yield increases, the hassle, expense, space, danger, and time involved can make constant or near constant venting a desirable alternative to enrichment. As long as the plant has the opportunity to take in new CO₂ at all times, from air that is over 200 PPM CO₂, the plants will have the required nutrients for photosynthesis. Most closets will need new CO₂ coming in every two or three hours, minimum. Most cities' will have high concentrations of CO₂ in the air, and some growers find CO₂ injection unnecessary in these circumstances. Some growers have reported to High Times that high CO₂ levels in the grow room near harvest time lower potency. It may be a good idea to turn off CO₂ 2 weeks before harvesting.

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VENTING

You have to vent a lot with a HID lamp, less so for fluorescence. Also, humidity build up requires that you vent at least a few times per day. For a room with a hot lamp that builds up heat quickly, the best vent would be one that cleared the room in 5 minutes, then would stop for 25 minutes before venting again, or similarly, vent 3 minutes, shut off 12 minutes, etc. The trick is to find a timer that will do this sort of thing. Not easy to find and not cheap. Once you need to regulate CO2 on and off inversely with the fan, your looking at a \$100 climate controller.

Alternatives are a thermostat that turns on a fan when a certain temperature is reached, and turns it off when the temp recedes 4 degrees. But it is a bitch to coordinate CO2 release with this one, since you don't know when the fan goes on. \$39 for this thermostat, but to sync it to CO2 with a voltage sensing relay is \$100 for the ready-made switch, so then the environment controller at \$100 is cheaper. All you really want is a fan that clears the air in a few minutes, a temperature switch that turns on and off the fan, and an inverse switch that turns off and on the CO2. If you can vent the room really quick and the heat does not build up too quickly, the CO2 could be run in a slow, continuous fashion, and would build up in-between the occasional quick exhaust cycles.

Two timers synced can be used, but the only ones cheaply available are the 30 min interval, 48 trips per 24 hours. So I could have a fan run 30 min on, then 30 min off. I could also sync it to the light so that I don't vent when the lamp is off. I can sync this to an identical timer that will turn on CO2 during the time that the fan is not on, and vice versa. It would be difficult to sync them closer than 5-10 min, but at least there would be a possible inexpensive solution. It costs around \$20 for two of these timers. Fans are expensive to buy for venting, but I just go down to the local electronic parts liquidators and they have muffin fans for \$5-10, so that's a real savings over the \$50-70 these fans cost new at the indoor garden stores. A good vent fan will keep the humidity and temperature down, and distribute CO2 to your plants from new incoming air. Internal air movement is very necessary as well. An oscillating fan should be used to circulate air within the grow room to help circulate CO2. It will also keep the humidity down, allowing the air to absorb more moisture, and reduce risk of fungus. A wall mount oscillating fan will not take valuable floor space. The best grow rooms have the most internal air circulation.

TEMPERATURE

Proper temperature is one highly variable factor. Most books state optimum grow temperature to be 70-80 degrees, but many list extenuating circumstances that allow temperatures to go higher. Assuming genetics is not a factor, plants seem to be able to absorb more light at higher temps, perhaps up to 90 degrees. High light and CO2 levels could make this go as high as 95 degrees for increased growth speed.* An optimum of 95 degrees is new data that assumes very-high light, CO2 enrichment of 1500 PPM and good regular venting to keep humidity down. It is not clear if this temperature will reduce potency in flowers. It may be a good idea to reduce temperatures once flowering has started, to preserve potency, even if it does reduce growth speed. But higher temperatures will make plants grow vegetatively much faster, by exciting the plants metabolism, assuming the required levels of CO2 and light are available, and humidity is not allowed to get too high. With normal levels of CO2, in a well vented space, 90 degrees would seem to be the absolute max, while 85 may be closer to optimum, even with a great deal of light available. Do not let the room temperature get over 35 C (95 F) as this hurts growth. Optimal temperature is 27-30 C (80-86 F) if you have strong light with no CO2 enrichment. Less than 21 C (70 F) is too cold for good growth.

Low temperatures at night are OK down to about 60 degrees outdoors, then start to effect the growth in a big way. Mid 50's will cause mild shock and 40's will kill your plants with repeated exposure. Keep your plants warm, especially the roots. Elevate pots if you think the ground is sucking the heat out of the roots. This is an issue if you have a slab or other type of cold floor. As temperature goes up, so does the ability of the air to hold water, thus reducing humidity, so a higher average temperature should reduce risk of fungus.

Contrary to many reports, high humidity is not good for plants except during germination and rooting. Lower humidity levels help the plant transpire CO2 and reduce risk of molds during flowering. Studies indicate the potency of buds goes down as the temperature goes up, so it is important to see that the plants do not get too hot during flowering cycles.

* D. Gold: CO2, Temperature and Humidity, 1991 Edited by E. Rosenthal.

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PESTS

You really have to watch pests, or all your efforts could result in little or nothing in return. Mites and Aphids are the worst; whiteflies, caterpillar and fungi are the ones to watch out for long term. Pyrethrum bombs can start you with a clean slate in the room, and then homemade or commercial soap sprays will do most of the rest. When bringing in plants from outside, pyrethrum every broad leaf top and bottom and the soil too. Then watch them closely for a week or two, and soap down any remaining bug life you find from eggs being hatched. This should do the trick for a month or two, long enough it won't be an issue before harvesting.

Fungus is another obstacle in the path of a successful growing season. When the flowers are roughly half developed they become susceptible to a fungus or bud rot. It appears that growing conditions for the fungus are best when temperatures are between 60 and 80 degrees and the humidity is high. The fungus is very destructive and spreads quickly. It is a spore type of fungus that travels to other buds via the wind so it is impossible to prevent or stop if weather conditions permit it to grow. If things should go badly and the fungus starts to attack your plants, you must remove it immediately or it will spread to other areas of the plant or plants. Some growers will remove just the section of the bud that is infected whereas other growers will remove the entire branch. Removal of the entire branch better insures that the fungus is totally removed, and also enables the grower to sample the crop a few weeks ahead of time. Fungi can wipe your crop quick, so invest in some SAFE fungicide and spray down the plants just before flowering if you think fungus may be a problem. Don't spray the plants if you have never had problems with fungus before. Keep humidity down, circulate air like crazy in the grow space and keep unquarantined outdoor plants out of the indoor space. Don't wait until after flowering, since it's not a good idea to apply the fungicide directly to flowers. Instead, flowers must be cut off when they are infected.

Most fungicides are very nasty, and you won't want to ingest them, so it is necessary to use one that is safe for vegetables. Safer makes a suitable product that is available at most nurseries; it contains only sulfur in solution. Use soap solution like Safer Insecticidal Soap to get rid of most aphid problems. Use some tobacco juice and chili pepper powder added to this for mites. Dr. Bronnars Soap can be used with some dish detergent in a spray bottle if you want to save money. Pyrethrum should only be used in extreme circumstances directly on plants, but can be used in a closet or greenhouse in the corners to get rid of spiders and such. It breaks down within a week to non-toxic elements, and can be washed from a plant with detergent solutions and then clear water. I find Pyrethrum to be the best solution for spider mites, if it is sprayed on young plants up to early flowering. Into later flowering, the tobacco and pepper/soap solution is your best bet, on a daily basis, on the under-sides of all infected leaves. Spider mites are by far the worst offender in my garden. I have finally learned not to bring plants from outside into the indoor space. They are always infected with pests and threaten to infect the entire indoor grow space. It is much more practical to work WITH the seasons and regenerate plants outdoors in the Summer, rather than bringing them indoors to regenerate under constant light. Start a plant indoors, take it outside in Spring to flower. Take a harvest or two, feed it nitrogen all Summer and it will regenerate naturally, to be flowered again in the Fall. Once a plant has been taken outside, leave it outside.

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TRANSPLANTING

There will be little or no shock if you are quick and tender in your handling of the plants. Make sure you only need to transplant twice, or better yet, once if possible, through the entire growth cycle. Transplanting slows you down. It takes time, it's tricky, it's hard work, and threatens the plants. Start in as large a container as possible, square is best. 16 ounce plastic cups work OK, and 2 liter soda bottles cut down may be big enough for the first harvest when growing hydroponically. One-gallon plastic milk or water containers will work too. Or start seeds and rooted cuttings in 16oz plastic cups. It's better to have less seedlings than it is to have many seedlings that need constant transplanting. These larger cups take only a little more space, and allow you to transplant only one time before harvesting the first crop. Transplant into a gallon water jugs (cut down to 3/4 gallon) before forcing flower growth. To regenerate this plant after harvesting, transplant it into a larger pot after it goes into vegetative growth once again, 5 gallon paint buckets work pretty well if you can spare the space, and a 2-3 gallon container would make this plant's 2nd harvest better than the first, given enough vegetative re-growth first.

One more tip: A Russian study showed that seedlings with at least 4" of soil to grow the tap root were more likely to go female. The source I'm quoting says "This may be why some farmers get female/male ratios as great as 80%/20%."

EARLY SEXING

It's possible to tell the sex of a plant early, and thus move male plants out of the main growing area sooner by covering a plant's lower branch for 12 hours a day while it's in a constant light vegetative state. Use a black paper bag or equivalent to allow for air flow while keeping out light. Be sure to set up a regular cycle for these covered branches. If light is allowed to reach them during the dark period, they may not indicate early at all. Use a magnifying glass to look at the early flowers sex type. A male plant will have a small club (playing card) looking preflower with a small stem under it. A female flower is usually a single or double pistil, white and wispy, emerging from an immature calyx.

Some people like to pre-force plants when they are 8" tall, in order to weed out the males. When growing outdoors, many growers do not wish to devote time, space or energy to male plants. Just put the plants on a 12 hours light cycle for 2 weeks, separate the females from the males, then revert the light cycle back to 18-24 hours to continue vegetative growth for the females. Keep in mind, this is a time consuming process and can put the plants back 2 weeks in growth. Don't pre-force plants unless you have lots of time. Just cover one branch per plant with black paper (light tight, breaths air) 12 hours every day under constant light to force pre-flowers and differentiate early.

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REGENERATION

It is possible to harvest plants and then rejuvenate them vegetatively for a 2nd and even 3rd harvest. A second harvest can be realized in as little as 6-8 weeks. Since the plant's stalk, and roots are already formed, the plant can produce a second, even third harvest of buds in a little more than half the time of the original harvest. When harvesting, take off the top 1/3rd of the plant. Leave most healthy fan leaves in the middle of the plant, cutting buds off branches carefully. On the lower 1/3rd of the plant, take off end flowers, but leave several small flowers on each branch. These will be the part of the plant that is regenerated. The more buds you leave on the plant, the faster it will regenerate. Feed the plant some Miracle Grow or any high nitrogen plant food immediately after harvest. When you intend to regenerate a plant, make sure it never gets too starved for nitrogen as it is maturing, or all the sun leaves will fall off, and your plant will not have enough leaves to live after being harvested.

Harvested plants can come inside for rejuvenation under continuous light or are left outside in Summer to rejuvenate in the natural long days. It will take 7-14 days to see signs of new growth when regenerating a plant. As stated before, and in contrast to normal growth patterns, lower branches will be the first to sprout new vegetative growth. Allow the plant to grow a little vegetative, then take outside again to reflower. Or keep inside for vegetative cuttings. You now have two or three generations of plants growing, and will need more space outside. But you will now be harvesting twice as often. As often as every 30 days, since you have new clones or seedlings growing, vegetative plants ready to flower, and regenerated plants flowering too.

Regenerating indoors can create problems if your plants are infected with pests. It may be best to have a separate area indoors that will not allow your plants to infect the main indoor area. An alternative to regenerating indoors is to regenerate outdoors in the Summer. Just take a harvest in June, then allow the plant to regenerate by leaving some lower buds on the plant, and leaving the middle 1/3rd of the plant's leaves at harvest. Feed it nitrogen, and make sure it gets lots of sun. It will regenerate all Summer and be quite large by Fall, when it will start to flower again naturally.

PRUNING

Plants that are regenerated, cloned and even grown from seed will need to be pruned at some point to encourage the plant to produce as much as possible and remain healthy. Pruning the lower limbs creates more air-flow under the plants in an indoor situation and creates cuttings for cloning. It also forces the plant's effort to the top limbs that get the most light, maximizing yields. Plants that are regenerated need to have minor growth clipped so that the main regenerated growth will get all the plant's energy. This means that once the plant has started to regenerate lots of growth, the lower limbs that will be shaded or are not robust should go. The growth must be thinned on top branches such that only the most robust growth is allowed to remain.

One nice aspect of regenerating plants, is that some small buds left on the plant in anticipation of regeneration will not sprout new growth and may be collected for smoke. The plant may provide much smokable material if it is caught before all the old flowers dry up and die with the new vegetative growth occurring. Try to trim a regenerated plant twice. Once as it is starting to regenerate, collect any bud that is not sprouting with new growth and smoke it. Then later, prune again to take lower clippings to clone and thin the upper growth so that larger buds will be produced. If a regenerated plant is not pruned at all, the resulting plant is very stemmy, does not create large buds and the total yield will be significantly reduced.

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HARVESTING AND DRYING

Harvesting is the reaping of the bounty, and is the most enjoyable time you will spend with your garden.

Plants are harvested when the flowers are ripe. Generally, ripeness is defined as when the white pistils start to turn brown, orange, etc. and start to withdraw back into the false seed pod. The seed pods swell with resins usually reserved for seed production, and we have ripe sinse buds with red and golden hairs.

It is interesting that the time of harvest controls the "high" of the buds. If harvested "early" with only a few of the pistils turned color, the buds will have a more pure THC content and will have less THC that has turned to CBD and CBN's. The lessor psychoactive substances will create the bouquet of the pot, and control the amount of stoniness and stupidity associated with the high. A pure THC content is very cerebral, while high THC, high CBD, CBN content will make the plants more of a stupid, or hazy buzz. Buds taken later, when fully ripened will normally have these higher CBN, CBD levels and may not be what you prefer once you try different samples picked at different times. Don't listen to the experts, decide yourself based on what you come to like yourself.

Keep in mind, a bud weighs more when fully ripe. It is what most growers like to sell, but take some buds early for yourself, every week until you harvest, and decide how you like it for yourself. Grow the rest to full maturity if you plan to sell it.

Most new growers want to pick early, because they are impatient. That's OK! Just take buds from the middle of the plant or the top. Allow the rest to keep maturing. Often, the tops of the plants will be ripe first. Harvest them and let the rest of the plant continue to ripen. You will notice the lower buds getting bigger and fuzzier as they come into full maturity. With more light available to the bottom portion of the plant now, the plant yields more this way over time, than taking a single harvest. Use a magnifier and try to see the capitated stalked trichomes (little THC crystals on the buds). If they are mostly clear, not brown, the peak of floral bouquet is near. Once they are mostly all turning brownish in color, the THC levels are dropping and the flower is past optimum potency, declining with light and wind exposure rapidly.

Don't harvest too late! It's easy to be too careful and harvest late enough potency has declined. Watch the plants and learn to spot peak floral potency. Do not cure pot in the sun, it reduces potency. Slow cure hanging buds upside down in a ventilated space. That is all that is needed to have great sinse. Drying in a paper bag works too, and may be much more convenient. Bud tastes great when slow dried over the course of a week or two.

If your in a hurry, it's OK to dry a small amount in-between paper sheets or a paper bag in a microwave oven. Go slow and check it, don't burn it. Use the defrost power setting for a slower, better drying. It will be harsh smoking this way though. A food dehydrator or food preserver will dry your pot in a few hours, but it will not taste the same as slow-dried. Very close though. And this will speed your harvest time (which can be nerve-wracking, with all this pot hanging around drying.)

Dry buds until the stems are brittle enough to snap, then cure them in a sealed tupperware container , burping air and turning the buds daily for two weeks. Once experienced grower told me to dry in an uninsulated area of the house (like the garage) so that the temperature will rise and fall each night, as the plant is drying. If you treat the plant as if it were still alive, it will use some of it's chlorophyll while it is drying, and the smoke will be less harsh.

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CLONING

Cloning is asexual reproduction. Cuttings are taken from a mother plant in vegetative growth, and rooted in hydroponic medium to be grown as a separate plant. The offspring will be plants that are identical to the parent plant. Cloning preserves the character of your favorite plant. Cloning can make an ocean of green out of a single plant, so it is a powerful tool for growing large crops, and will fill a closet quickly with your favorite genetics. When you find the plant you want to be your "buddy" for the rest of your life, you can keep that plant's genetic character alive for decades and pass it on to your children's children. Propagate and share it with others, to keep a copy, should your own line die out. A clone can be taken from a clone at least 20 times, and probably more, so don't worry about myths of reduced vigor. Many reports indicate it's not a problem.

Cloning will open you to the risk of a fungus or pests wiping out the whole crop, so it's important to pick plants that exhibit great resistance to fungus and pests. Pick the plant you feel will be the most reliable to reproduce in large scale, based on health, growth rate, resistance to pests, and potency. The quality of the high, and the type of buzz you get will be a very important determining factor. Take cuttings for clones before you move plants from vegetative grow area to the flowering area. Low branches are cut to increase air circulation under the green canopy. Rooted clones are moved to the vegetative growth area, and new clones are started in the cloning area using the low branch cuttings. Each cycle of growth will take from 4-8 weeks, so you can constantly be growing in 3 stages, and harvesting every 6-8 weeks. Some types of plants are more difficult to clone than others. Big Bud is reported to not clone very well. One of my favorite plants, Mr. Kona, is the most amazing pot I ever smoked, but it is hard as hell to clone. What a challenge! I noticed other varieties that were rooting much quicker, but it was the stone I was after! Once you find the psychoactive, almost hallucinogenic properties of some Indica/Sativa hybrids, you never want to smoke a pure Indica again. Indica is however, great medicinally, so I like to grow a few pure strains too.

If a plant is harvested, you can sample it, and decide if you want to clone it. Pick your favorite 2 or 3 distinctly different types of plants to clone, based on trying the harvested plants. The plants you want to clone can be regenerated by putting them in constant light. In a few weeks, you will have many vegetative cuttings available for cloning and preserving your favorite plants. Always keep a mother plant in vegetative mode for any strain you want to keep alive. If you flower all your clones, you may end up killing off a strain if you don't have any plant devoted to being a mother. I killed off a sacred strain accidentally this way; my harvested plants failed to regenerate and the strain would have died completely had not previously given it to friends to grow it as well. I was in luck, and a buddy set me up with another clone of this strain to grow as a mother plant for a new crop of clones.

After two months, any marijuana plant can be cloned. Flowering plants can be cloned, but the procedure may take considerably longer. It's best to wait, and regenerate vegetative plants that have been harvested. A single regenerated/harvested plant can generate hundreds of cuttings. Before taking cuttings, starve the plant for nitrogen for a week at least, so that the plant is not extremely green, as this will make rooting take longer. Take cuttings from the bottom 1/3 of the plant, when doing ordinary pruning. Cut young growth tips from a vegetative stage, mature plant 3-5 inches long with a stem diameter 1/5-1/10 inch. Cut with a sterile razor blade or X-acto knife (flamed) and immerse the cut end of the clone into a tub of distilled water mixed with 1/4 tspn Peters 5-50-17 per gallon. Next, cut the bottom .2 inch off the end while it is submerged, using a diagonal cut. Remove the clone from the tub and dip into a liquid cloning solution following instructions on the label. Dust with RootToneF and place in cloning tray or medium. Flowering plants can be cloned too, but may take longer, and may not have as high a success rate.

Cloning goes quickest with the liquid rooting solutions in a warmed, aerated tray, with subdued lighting and high humidity. Placing cuttings into 1" rockwool cubes in a covered tray also works. In a closet, you can make space above the grow area so that the heat of the lamp warms the tray (passive collecting) and spare the expense and hassle of the aquarium heater (\$24) or agricultural heating pad w/ thermostat (pricey). A double 4" fluorescent lamp will be perfect. Leave lamps on for 24 hours a day. Cuttings should root in 2-3 weeks. I found only one liquid rooting hormone solution that was not over \$10. (Olivia's Gel was \$12 for a 1.6 ounce bottle. Geez, what is this stuff, gold?) I found some dipNgrow for \$9, considered myself lucky, and got a tray and clear cover for \$7. A clear tray cover or

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greenhouse enclosure is needed to bring up humidity to 90% (greenhouse levels). Liquid rooting hormone seems to be much more effective than powders. Some types available are Olivia's, Woods, and dipNgrow.

Mix a weak cloning solution of high P plant food (such as Peter's 5-50-17), trace elements, and epsom salts and then dip plants in rooting solution per instructions on label. All of the above nutrients should be added in extremely small amounts, 25% of what would normally be used on growing plants. Or use a premade solution such as Olivia's Rooting Solution. Corn syrup has been reported to supplement the sugars needed by the plant during cloning, since it consists of plant sugars. Use a powder fungicide too, like RootoneF to be sure you don't spoil the clones with fungus. This is important, since clones and fungus like the conditions you will be creating for good rooting:

mild light, 72-80 degrees, high humidity In rockwool, there is no need for aerating the solution, just keep the cubes in 1/4" of solution so they wick and stay moist at all times. Try to keep clones evenly spaced, and spray them with water once a day to keep them moist and fresh. Pull out clones if they are diseased and dying, to keep them away from healthy starts.

Another method is to float cuttings in a tray full of solution on polystyrene disposable plates, or styrene sheets (shipping/packing material) with holes punched, so the tops and leaves are out of the water. Take off all large leaves, leaving only smaller top leaves to reduce demand on the new rooting stalk. Aerate the tray solution with an air pump and bubble stone. Keep solution at 72-80 degrees for best results. Change the solution daily if not using an air stone and pump, so that oxygen is always available to the cuttings. A week later, clip yellowing leaves from cuttings to reduce water demands as the cuttings start to root.

Buy a tray with a clear cover made for rooting at an indoor gardening supply house. You must keep humidity very high for the clones. Put cuttings in an ice chest with cellophane over the top and a light shining down if you don't want to pay for the grow tray and cover.

It's also possible to directly place a dipped cutting in a moist block of floral foam with holes punched, or vermiculite in a cup; be sure to root cuttings in a constantly moist medium. Jiffy peat cubes are not recommended, as published reports indicate results were not good for rooting clones. Place starter cubes in tray of solution. Check twice a day to be sure cubes are moist, not drenched, and not dry. After about 2-3 weeks, rootlets will appear at the bottom of the pods. Transplant at this point to the growing area, taking care not to disturb any exposed roots.

One grower writes us:

I have had virtually all attempted clones root with the following scheme:

1. Prep cutting by removing large leaves on tip to be cut, allow to heal.
2. While holding underwater, take final diagonal cut on stem to be rooted.
3. Dip in Rootone, then spear stem about 2" deep in 16 oz. cups of 1/2 vermiculite, 1/2 perlite, which are kept in a styrofoam cooler. 3. Spray cuttings with a VERY mild complete fert. soln.
4. Cover top of cooler with Saran Wrap, then punch holes for ventilation.
5. Keep cooler in relatively mild temps, low light, and spray cuttings daily.
6. Cuttings should root in about 3 weeks.

Cloning is not as easy as starting from seed. With seeds, you can have 18" tall plants in 6 weeks or less. With clones, it may take 6 weeks for the plant to sprout roots and new growth. Seeds are easily twice as fast if you have empty indoor space being wasted that needs to be put to use quickly. Always breed a few buds for seeds, even if you expect to be cloning most of the time, you could get wiped out, and have nothing but your seeds left to start over.

Cloning in rockwool seems to work great, and no air pump is needed. I paid \$9 for 98 rockwool starter cubes. A plastic tray is available (\$.95) that holds 77 cubes in pockets allowing the cubes to be held in a tray of nutrient solution. They are easily removed and placed in a larger rockwool growing cube when rooted.

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BREEDING

It is possible to breed and select cuttings from plants that grow, flower, and mature faster. Some plants will naturally be better than others in this regard, and it is easy to select not only the most potent plants to clone or breed, but the fastest growing/flowering plants as well. Find your fastest growth plant, and breed it with your "best high" male for fast flowering, potent strains. Clone your fastest, best high plant for the quickest mono-crop garden possible. Over time, it will save you a lot of waiting around for your plants to mature.

When a male is starting to flower (2-4 weeks before the females) it should be removed from the females so it does not pollinate them. It is taken to a separate area. Any place that gets just a few hours of light per day will be adequate, including close to a window in a separate room in the house. Put newspaper or glass under it to catch the pollen as the flowers drop it. Keep a male alive indefinitely by bending it's top severely and putting it in mild shock that delays it's maturity. Or take the tops as they mature and put the branches in water, over a piece of plate glass. Shake the branches every morning to release pollen onto the glass and then scrap it with a razor blade to collect it. A male pruned in this fashion stays alive indefinitely and will continue to produce flowers if it gets suitable dark periods. This is much better than putting pollen in the freezer! Fresh pollen is always best. Save pollen in an air tight bag in the freezer. It will be good for about a month. It may be several more weeks before the females are ready to pollinate. Put a paper towel in the bag with it to act as a desiccant. A plant is ready to pollinate 2 weeks after the clusters of female flowers first appear. If you pollinate too early, it may not work. Wait until the female flowers are well established, but still all while hairs are showing. Turn off all fans. Use a paper bag to pollinate a branch of a female plant. Use different pollen from two males on separate branches. Wrap the bag around the branch and seal it at the opening to the branch. Shake the branch vigorously. Wet the paper bag after a few minutes with a sprayer and then carefully remove it. Large plastic zip-lock bags also. Slip the bag over the male branch and shake the pollen loose. Carefully remove the bag and zip it up. It should be very dusty with pollen. To pollinate, place it over a single branch of the female, zipping it up sideways around the stem so no pollen leaks out. Shake the bag and the stem at the same time. Allow to settle for an hour or two and shake it again. Remove it a few hours later. Your branch is now well pollinated and should show signs of visible seed production in 2 weeks, with ripe seeds splitting the calyxes by 3-6 weeks. One pollinated branch can create hundreds of seeds, so it should not be necessary to pollinate more than one or two branches in many cases.

When crossing two different varieties, a third variety of plant will be created. If you know what characteristics your looking for in a new strain, you will need several plants to choose from in order to have the best chance of finding all the qualities desired. Sometimes, if the two plants bred had dominant genes for certain characteristics, it will be impossible to get the plant you want from one single cross. In this case, it is necessary to interbreed two plants from the same batch of resultant seeds from the initial cross. In this fashion, recessive genes will become available, and the plant character you desire may only be possible in this manner. Usually, it is desirable only to cross two strains that are very different. In this manner, one usually arrives at what is referred to as "hybrid vigor". In other words, often the best strains are created by taking two very different strains and mating them. Less robust plants may be the result of interbreeding, since it opens up recessive gene traits that may lead to reduced potency. Hybrid offspring will all be very different from each other. Each plant grown from the same batch of seeds collected from the same plant, will be different. It is then necessary to try each plant separately and decide it's individual merits for yourself. If you find one that seems to be head and shoulders above the rest in terms of early flowering, high yield and get buzz, that's the plant to clone and continue breeding. In depth genetics is beyond the scope of this work. See Marijuana Botany; Smith, for more detailed info in this area.

SINSEMILLIA

When the female plant is not allowed to pollinate, it grows full of resin that was intended to make seeds. False seed pods swell with THC laden resin and the pistils turn red and orange and withdraw into the pods. Then the plant is harvested. Seeds are not part of the bud when the flowers mature. This is called Sinsemillia, and means "no seeds".

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SINSE SEEDS

It is possible to cross your favorite two female plants to create a new strain of seeds that will produce all female plants. Preferably, these two plants will be different types of plants, not from the same mother's seeds.

This will create the best offspring, since it will not lead to inbreeding. It is easier to gauge the quality of female plants than male plants, since the smoke is more potent and easier to judge its finer qualities. Plants from seeds created in this fashion will be all female plants since there will be no chance of male chromosomes from female parents. Use Gibberellic Acid on one branch of a female plant to induce male flowers. Gibberellic Acid is sold by nursery supply houses for plant breeding and hybridizing. Spray the plant once every day for 10 days with 100 ppm gibberellic acid. When the male flowers form, pollinate the flowers of your other target female plant you have selected. Just pollinate one branch unless you want lots of seeds! Once the branch has male flowers, cut the branch and root it in water, with glass under it to catch the male pollen when it drops. Use a rooting solution similar to the above cloning solution. Collect the pollen with a plastic bag over the branch and shake it. Use a razor blade to scrap up fallen pollen and add it to the bag too. It is also possible to pollinate the flowers of the plant you create the male flowers on, crossing it with itself. This is used to preserve a special plants characteristics. Cloning will also preserve the plants characteristics, but will not allow you to store seeds for use later. Crossing a plant with itself can lead to inbreeding problems, so it may not be the optimum solution in many cases. I once tried using Gibberellic Acid, sprayed on a healthy female, every day for over a week. No male flowers appeared on the plant. Your mileage may vary.

ODORS AND NEGATIVE IONS

Negative ion generators have been used for years now to cut down on odors in a grow room, but reports are coming in that a negative ion generator will increase growth speed and yield. No true evidence to support this, however it does make sense, due to the fact that people and animals seem to be altered in a positive way by negative ions in the air, so plants may "feel" better too. Try putting one in the grow room. You may notice the buds don't have as much scent when picked, but that may be desirable in some cases.

A negative ion generator can be purchased for \$15 to \$100 depending on the type and power involved. Some have reversed cycles that collect the dust to a charged plate. It is also possible to use grounded aluminum foil on the wall and shelf where the ionizer sits, to collect these particles. Just wipe the foil clean once a month. It should be grounded to an electrical outlets ground wire. If you don't cover the wall and shelf with paper or foil, the wall will turn dark with dust taken from the air, and you will have to repaint that wall later.

OXYGEN

O₂ to the roots is a big concern, since the plant requires this for nutrients to be available, and to rid itself of toxins, etc. One of the easiest things to do is use food grade hydrogen peroxide in the water to increase the availability of oxygen in the water. H₂O₂ has an extra oxygen atom that will easily break away and can be used by the plant.

Oxygen Plus is a plant food that contains 25% hydrogen peroxide and is perfect for this use.

Using a planting medium that allows for plenty of aeration is also really important. Be sure you have good drainage by using Perlite, sand, or gravel in your mix and at the bottom of pots. Don't use a medium that holds too much water, or you may significantly reduce the oxygen available to the plant. More on that in the section on hydroponics. Aerating the water before watering is also a good idea. In the case of soil potted plants, use an airpump to aerate the water overnight before watering your plants, or put the water in a container with a cap and shake it up real good before giving to the plants.

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SAFETY AND PRIVACY

Utility companies can tell your bill is way off from the same time last year, and police are finding growers this way. More than 500 watts in the family home running constantly will show up as a regular monthly increase in electricity use. You can claim space heaters, more people living on the premises, too many television sets, and late hours, if they happen mention it to you (innocently). If the police knock and ask you about it, don't let them in, and move your plants to another location during the wee hours in a vehicle not your own.

Upon moving into a new place, it may be desirable to immediately establish high electricity use, so that your electrical use history won't reveal your activities in the future...

Light leaks, open windows, heat expelled from rooms that would normally be cool, and rip-offs are all serious issues to be concerned about. Don't use a burglar alarm on when your away from the house. People are busted this way when the kids try to rip off the garden and the police come. Lock the house up well, and let them take it if they need it so bad. It's not worth getting busted for a burglary...

Think ahead to any situation that will require outsiders to visit sensitive areas of the house. Repairmen, solicitors, meter readers, neighbors, appraisers, and pets should all be considered and contingency plans made in advance.

DISTILLED WATER

Some growers report purified or distilled water helps their plants grow faster. Perhaps due to sodium and heavy metals found in hard water that are not present in purified water. Hard water tends to build up alkaline salt deposits in soil that lockup trace minerals, and cause iron, copper and zinc deficiencies. There are several types of purified water, but many are not free of minerals that could be causing salt buildup over an extended period of time.

Tap water comes in two flavors, hot and cold. The cold pipe has less calcium and sodium buildup in it, and should be freer of sediment once the water has been turned on and allowed to flow for 30 seconds. Hot water will have rust, lead deposits, and lots of sodium and calcium, so much so, you will see it easily. Use only the amount of hot water needed to make the water the correct temperature (70-80 F). Tap water filtered through a carbon (charcoal) filter will be free of chlorine and most large particles, but will still contain dissolved solids such as sodium and heavy metals (lead, arsenic, nickel, etc.). Purified bottled water will be either Reverse Osmosis or some form of carbon/sediment filtered water. When purchasing water at a store, unless it says RO or Distilled, don't bother buying it. It could still have the same dissolved solids and heavy metals your tap water has.

BIRTH CONTROL PILLS

A solution of one pill to one gallon of water has been reported to cause increased growth speed in tomato plants. It is possible this will help herb plants too. One treatment administered before flowering and one administered a few weeks before harvesting might help the plant mature faster. One grower told a story of the same type of plants, one administered the estrogen grew to 20 feet, while the other was 7 feet. This may be purely anecdotal, but it may work. Try it and report back to us on results.

SEED AND BUD STORAGE

Use a seal-a-meal to hermetically seal the bag with no air inside. Freeze or refrigerate, and bud and seed can be kept for years this way. Rap seeds in a paper towel to absorb moisture. Keep them in the freezer, and pull out only as many seeds as you need, then pop them back in the freezer quickly.

A FINAL COMMENT

Good results can be had even in what appear to be rather marginal situations. (i.e.: a four inch pot in a room with a skylight.) With the minimum of: well drained medium, good light with ventilation, regular application of a complete fertilizer, pest control, and avoidance of detection, anyone can take a viable seed to maturity.

One need not have a lot of money, or even know-how to grow good plants.

THE BEGINNERS'S GUIDE TO HASH-GROWING

This book is the result of a couple of amateur gardeners coming across a wealth of desktop publishing equipment, while enjoying the fruits of their labours. It is heavily based on other booklets we have read, some of which were so badly typed that we just had to do something about it.

Some of the inaccuracies of the old document have been removed, Americanization (sic.) has been translated, and a few improvements have been made.

As you will discover, growing your own is not just a cheap way of getting it. You also ensure you are smoking ONLY pot, and obtain a great deal of satisfaction from watching your plants grow from a tiny seed to a six-foot tall monster. It also does wonders for the balance of world trade.

You may have tried to grow hemp plants before, usually just by bunging a few seeds in a flower pot on the windowsill and crossing your fingers. You probably got an anaemic thin plant about 2-3 feet tall which probably gave you a mild buzz. This book tells you how to grow 'em a little bigger than that, and how to increase the yield of the end result by two to four times.

An indoor garden will produce about 16 ounces of grass every six months. The gardens are really quite simple to build, the only technical knowledge being the wiring of a fluorescent tube. Basically, you just hang a fluorescent light that can be raised and lowered over some pots with a good soil mixture. All the materials you need are available at nurseries, garden shops and DIY stores.

Homegrown grass is bright green, and tastes pure and clean. Once you have experienced the pleasure of working with nature and enjoying clean, clear highs, we doubt that you'll ever want to buy commercial grass again. If you really want hash oil or resin, you can follow the method in a book called "Dr Atomic" - soon to be plagiarised, but there's nothing wrong with straight grass. After all, it isn't costing you much.

Marijuana is an especially rewarding plant to cultivate because it is one of the fastest growing and most responsive plants. The Hemp plant (*Cannabis Satavia*) is highly adaptive and grown all round the world. Under optimum conditions, it may grow up to twenty feet high. If you're growing it outdoors, make sure you have a very high fence !

Such giants usually grow in tropical and semi-tropical zones, where they flourish in the strong sunlight. There are male and female plants as well as hermaphrodites (that's male and female parts on the same plant).

INDOOR CULTIVATION

The Indoor Garden

Under artificial light, marijuana grows very fast; about 3-6 feet in three months. As you want the lights fairly close to the plants, you must arrange the lights so that their height can be altered. Hang the fixtures by a rope or chain from the walls or ceiling, or from the top of a frame at least 6 feet high, constructed of 2" X 2"s. The bar for hanging clothes on in a wardrobe works quite well if it is high enough. Try to obtain an industrial type light fixture with a built-in reflector, so that no light is lost. If your fixtures are not equipped with reflectors, mount them on a sheet of white painted plywood, make a reflector from white posterboard, or (at a pinch) sheets of white cartridge paper. Don't use aluminium foil (see later).

Ten watts of tube power for each square foot of growing area is adequate for healthy growth, but for a fast growing, lush crop, use at least 20 watts per square foot. The size and shape of your garden should correspond to the light system, so if the garden is 1 X 4 feet, use 2 four-foot tubes (80 watts). If the garden is 8 X 2 feet, use 4 eight-foot tubes. One eight-foot tube emits more light than 2 four-foot tubes, so try to use as few tubes as possible. Marijuana can absorb up to 80 watts per square foot. Increasing the amount of light will increase the growth rate, and the quality of your plants.

The garden should be surrounded by reflective surfaces to contain all of the light. This will increase the efficiency of the lighting significantly and the light will be nearly uniform throughout out the garden until the fixtures are more than 2 feet high. A flat white paint is a better reflecting surface than aluminium foil or glossy white paint. Flat white has about the same reflecting capacity as aluminium foil, but reflects the light more uniformly. Paint walls flat white, and hang posterboard, white plastic curtain, thick white paper

etc. on any open sides from the top of the fixture or frame. Sticking white card over the inside of your wardrobe is fine if you can find the white card for free. If your reflectors are the only enclosure for your plants, make them waterproof, and they will insure a healthy humidity by containing moisture evaporating from the soil and transpired by the plants.

Don't rely on training pets to stay out of the garden. Cats know damn well what the stuff is, and they may chew the leaves or consume the best parts of several plants. Dogs aren't much better either. Scratching in soil is in and animals' nature. After all, look at all that time you spent teaching Tibbles to use the litter tray. One moment of weakness can destroy months of work (see "cuttings" in case of dire emergency). If the garden is accessible to pets, surround it with chicken wire or heavy plastic. Ironmongers sell plastic on rolls, and inexpensive plastic dropcloths. Cover the floor with plastic too. It will protect your floor (and, if you're in a flat, your neighbours ceiling) from possible water damage. The last thing you want is the council sniffing around for leaks !

Artificial Light

The most effective and efficient artificial light for plant growth is fluorescent light. There now follows a (very) brief physics lesson: The white light you see emitted by a fluorescent bulb consists of all the colours of the spectrum. The designation - Daylight, Warm White, Gro-lux, Optima, etc. - give a heavy clue to what particular combination of bits of the spectrum each bulb generates. Plants respond primarily to red and blue light, and for healthy growth, a combination of these two colours must be provided. Blue light stimulates leaf growth, produces short, stocky stems, and encourages robust development. Red light is used for stem and root growth, and to promote flowering.

The best fluorescent tubes are those that are specifically manufactured to give out light useful to plants, and have a distinct purple hue. Some of these are the Standard Gro-lux, Wide Spectrum Gro-lux, and plant Gro.

Sizes suitable for growing marijuana are 4,6, and 8 feet long. Regular wattages for all of these tubes are about 10 watts for each foot of their

length (80 watts for an eight-foot tube). They also come in higher wattage sizes. These are Power Twists, High Output (HO) and Very High Output (VHO) tubes, the largest being a 215 watt, eight-foot tube. These high output tubes are not always available, and tend to come a little on the expensive side. You only really need to use them in an exceptionally large garden.

Regular fluorescent tubes can be used if you can't get Gro-tubes. They don't work quite as well, but they will grow a perfectly healthy crop, and usually work out more than a little cheaper. Daylight, or Cool White tubes can be used in conjunction with either Natural White or traditional (plug-in) bulbs.

Normal bulbs and Natural White both provide the red component of light, while the others tend towards the blue end. Use them in a one to one ratio, evenly distributing the red and blue sources. Compared to the fluorescent tube, the traditional lightbulb is about one third as efficient, has a much shorter life, and can cause problems with it's excess heat. Not only might it scorch your plants, it could set the whole house up if you haven't supported the lights properly. But think what a wonderful time the fire-brigade would have
....

Pots and Containers

Plants can be started in flower pots, milk crates, institutional size tin cans, polystyrene packaging, plastic jugs, or practically any container that is waterproof, at least 4" wide, and doesn't mind having a few holes punched in the bottom of it for drainage. Grow-bags are suitable, but will need holes punched in the bottom for drainage, and will probably need their pH checked.

A single large box has the advantage of giving more room for the roots to spread out, but requires a lot more soil and makes moving, lighting and rotating the plants impractical.

In it's natural state, marijuana sends down a tap root up to half the length of the plant. Apart from the fact that there aren't many three-foot deep plant pots about, trying to simulate natural conditions would be impractical in terms of weight, space, cost and labour.

The purpose of the soil (not necessarily ordinary dirt) is to provide water and nutrients, and to anchor the plant down. With strict attention to proper watering and fertilizing techniques, a six-foot plant can be grown in a four-inch pot. The plant will, however, grow much better in a series of successively larger pots - six to ten inch pots are a good median size, and aren't too heavy to move around when necessary.

Use as many pots as you can fit under the lighting system. The pots can always be thinned out if the plants become too crowded. Choose pots that are at least as wide at the top as the bottom, so that the soil can breath and dry out more easily.

Wash all cans, crates and pots etc thoroughly to remove any contaminants and/or insects. Boil clay pots for ten minutes to sterilize them. Some plastic, and most clay, utensils can be dampened and put in a microwave for ten minutes instead.

Soil Preparation

Marijuana grows best in a well-drained sandy soil or loam which is high in nitrogen and potash, at least medium in phosphorous, and which contains little or no clay. The pH should be between slightly acidic (6.5) and slightly alkaline (7.5). If the pH is either too low or too high it will interfere with nutrient uptake. The pH is measured on a scale of 0 to 14 with 7.0 assigned as neutral. pH is a measure of the relative concentrations of hydroxonium ions (H_3O^+) to hydroxide ions (OH^-). Several varieties of test kits and meters can be purchased from garden stores which test the pH and nutrient contents of the soil. Litmus paper (purple or blue) can be obtained from some chemists. Many agricultural schools or colleges will test soil pH and nutrient contents for a nominal fee.

Soil pH is raised to an acceptable level by adding slaked (hydrated) lime, limestone and marl. There is no set formula we can give for raising the pH. At a low pH it takes less time to raise the level by one point than it does when the pH is nearer to neutral (7.0). Sandy soils require less lime than clay soils to raise the pH. In general, if the soil tests acid, add 2 cups of

hydrated lime for each 50 lb bag of soil. On a more modest scale, this works out at roughly one tablespoon for every 1 1/2 lbs of soil. Wet the soil thoroughly after mixing. Re-test the soil in about 2 weeks, and repeat the application until the pH is in an acceptable range. Soil that is too alkaline is treated in the same way, but with aluminium sulphate at a rate of 1/2 cup per 50 lbs of soil.

If you are digging up your soil, sift it well to remove stones and root clods. Bake the soil in a 200 degree centigrade oven for twenty minutes in one-inch layers, in a pressure cooker at 15 lbs/sq in pressure, or in a microwave on full for ten minutes (make doubly sure there are no foreign particles in it). This will destroy any weed seeds, insect eggs and disease organisms in the soil.

It is, much, much, simpler to buy commercially prepared soils. These are usually sterilised (but if the bag has been opened or holed, sterilize again anyway) and have a good balance of nutrients. Ask for soil with a neutral pH. Some nursery-men (and women) will sell you anything, so check the pH anyway and reject any soil for "lime-hating" plants.

We have had good results from some brands using composted seaweed as an ingredient.

The consistency and structure of the soil is important for healthy root development, drainage and uniform water dispersion. The medium should not cake when dry (this rules out John Innes No. 3) and should remain spongy or loose when wet. Test the consistency, and adjust it if necessary.

To test the consistency of the soil, lightly moisten some and squeeze it in your fist. The ball should crumble easily when touched. Soil consistency can be adjusted by adding perlite, vermiculite, sand or kitty litter.

Perlite and vermiculite are inexpensive commercial products which are much lighter than sand and are sterile. Vermiculite absorbs and holds water and air in its fibre. Perlite traps moisture and air on its irregular surface much like sand. Sphagnum or peat moss is often used to adjust soils, but should not be used for marijuana as it tends to make the mix acidic. If you have alkaline soil to start with though, you might get away with it.

Soils found deficient in nutrient content can be enriched by adding humus (decayed organic matter) or fertilizers such as rose food, liquinure etc. Humus is acidic and can alter the pH.

Soil-less mixtures are inexpensive and easy to prepare. They work well, are neutral in pH and light in weight, but have absolutely no nutrient content. They must be carefully fertilized and are not recommended for an inexperienced grower. It is all too easy to over- or under-fertilize the plants.

Two tested formulas are:

- 1) One part perlite or sand to one part vermiculite and 1 tbsp of lime per quart of mixture.
- 2) One part perlite or sand to one part Jiffy Mix and 1 tbsp of lime per quart of mixture.

You can mix three parts of the soil-less mixture to one part cow manure, or rely solely on soluble fertilizers when watering.

Simple Guidelines

Some of you who are not familiar with gardening may be a little overwhelmed by all this talk of pH, nitrogen etc... so here is a simple uncomplicated formula for those of you with no experience with plants:

Buy commercial soil. Avoid brands that have peat in their names, and not just because peat is an over-exploited resource. It is very unlikely that a commercial soil will be too alkaline for healthy growth, but it may well be too acidic. The simplest way to assure yourself your soil is not too acidic, is to put a piece of damp blue litmus paper (blue litmus is available from some chemists and garden centres) under the surface of the soil. Wait a few minutes and then take it out. It will not harm the soil - litmus comes from a lichen.

If the paper turns pink, the soil is acidic and lime must be added. Mix two cups of slaked (hydrated) lime, from your garden store, to each 50 lbs of soil. Don't add lime if the paper remains blue. If you find yourself asking "is this paper pink, purple or just wet ?", then the soil is probably slightly acidic and within an acceptable range for healthy growth.

Mix 10 lbs of natural, sterilized fertilizer (usually based on cow manure or chickenshit) to each 50 lbs of soil. If you have some aversion to muck, or don't like the smell (well rotted manure doesn't smell, by the way) then you can use a soluble fertilizer when watering. We use a brand called 'phostrogen', which seems to work well. By volume, also mix in one part of sand, perlite or vermiculite for every three parts of your soil. This helps maintain the right soil texture for healthy root growth.

After potting and watering, the mixture should be re-tested in about a fortnight if it tested acidic to begin with.

If it is still acidic, add hydrated lime by mixing one tbsp of lime per quart of water, the first few times you water. Test your water supply by dipping a piece of litmus in plain water to determine if it is influencing your tests.

To pot any of the mixtures, cover the drainage holes with a square of newspaper or window screen to prevent soil from running out. Next, put in a layer of sand, perlite, vermiculite or kitty litter about one inch deep to ensure good drainage. Fill the pots to within 3/4 inch from the top of the pot with the soil mixture. Water the pots until the soil is evenly moist, and allow the pots to stand for a day or two so that bacteria necessary for nutrient uptake can begin to grow and the fertilizers can start to dissolve into the soil.

Seeds and Germination

The potency of marijuana is, in part, hereditary. Choose your seeds from the best grass available. Different strains grow at different rates. For uniformity of growth, take all seeds from the same batch of grass. This will help when it comes to lining them up under lights.

Hemp seeds from angling suppliers are very variable in quality and germination rate. They are treated, but about one in twenty still manage to sprout. Only use those that form sprouts over a centimetre long.

Choose seeds for their size and colour. The large plump ones with good colour, black, brown, grey or mottled - have the best chance of germinating. Seeds that are old, badly bruised or immature (green or white) are probably not

viable. If they are all you can get, you'll have to plant a lot of them and hope that some exceptional specimens "take".

Seeds are rarely viable after about three years, and should be stored in an airtight container. The crisper section in your refrigerator is an ideal place; dark and cool. You can get some idea of the viability by placing a seed between your thumb and fore-finger. If the seed does not crumble when pressed hard, it is probably viable.

Many books recommend that a germination box should be built to start the seeds in. This is an extra hassle that is not necessary. Transplanting the seedlings from one medium to another often subjects them to transplant shock, which will delay growth. With the following procedure you'll not have any problems.

Soak the seeds overnight in a glass of water or in wet towels to give them a head start in the water absorption stakes. Adding about a teaspoon of "Domestos" (double for thin bleaches) to half a pint of water will prevent fungus forming on the seeds. It does not harm the seeds in any way, believe me.

Poke 5 or 6 holes about 1/4 - 1/2 inch deep and evenly spaced in each pot. Place one seed in each hole and cover lightly with soil. Carefully, so as not to disturb the seeds, moisten the soil and keep it moist until the seeds have sprouted.

If you are using a bulk lot of not very viable seeds, put them in a seed tray with 1 1/4" of seed and cutting compost in the bottom. Moisten with a sprayer and, as mould from rotting seeds will be a problem, spray with "Benomyl" or another fungicide if you know of a better one. Scatter many seeds over the surface, sprinkle compost over the top to only just cover the seeds, and dampen with water and fungicide. Put an incubator top on, or put it inside a clear plastic bag. These precautions are not necessary with good seeds, but then the ones you find in bird-seed aren't particularly renowned for their quality.

The seeds will sprout in three to fourteen days, depending on their variety and viability. If you have only a few seeds and want to give them the best

chance possible, plant them pointed end up. The seedling will then expend the least amount of energy breaking through the soil. This is not critical and is unnecessary if you have plenty of seeds.

Light System and Germination

Some say that you need to light the seeds during germination. We have found that it makes little difference, and that normal daylight and room temperatures are fine.

Once the seeds have sprouted, place the light two to six inches above the top of the plants and maintain this distance for the duration of growth. The short distance between the light and the plant will encourage the seedling to develop with a stocky stem rather than a long, fragile one. At some stages the plants grow a couple of inches a day, so you may have to adjust the lights several times a week. Usually, seeds will sprout 2-7 days after planting. Older seeds may take up to 3 weeks.

It is important for the normal development of the plants that they receive a regulated day/night cycle. We emphatically recommend that you use an automatic electric timer, so that your plants will not suffer from your irregular hours, dirty weekends, or forgetfulness. Once the seeds begin to sprout, set the timer cycle for 18 hours of light a day, and leave it on this setting for the duration of your garden (see the section on Photoperiod).

It is best to set the timer so that your plants are not disturbed by any light during their night period. If they are subjected to even a dim light too often during the night cycle, the plants' growth pattern may be disrupted and they may develop abnormally. If you use a light in the growing area, use a green bulb. Plants are not sensitive to the green spectrum.

Watering

Plants growing under artificial light have a long photoperiod, and no cloudy days, so they grow extremely fast; one and a half feet per month is not unusual. This means that the plants will use a lot of water. Since the space around your plants is limited, you'll have to water them fairly often. This

does not mean watering them daily, or keeping the pots saturated. Plants grown in a continuously wet soil are slower growing, and probably less potent than normal. They often develop stem rot. Allow the pots to go through a wet and dry cycle. This will add in nutrient uptake, especially on potassium, and aerate the soil. In general, when the soil one inch deep is dry to touch, water it enough so that the soil is saturated but not so much that water runs out of the drainage holes, carrying away the soils valuable nutrients.

Self-watering plant pots are fine for keeping the plants alive while you go off on holiday, but try not to use them in their intended role of keeping the soil continuously moist.

If you underwater your plants, they will wilt. Plant cells are kept rigid by the pressure of the cell contents (mostly water). With the water gone, they collapse. First the bottom leaves droop, and the condition works itself up the plant until the top lops over. If a plant wilts, water it immediately, and it will recover within a few minutes. This happens so fast you can actually follow the movement of the water as it goes up the plant.

There is no way we can tell you exactly how often to water your garden. Light, temperature, humidity and the size of the plants and pots are only a few of many variables that determine the water uptake.

Try to reach a median. Don't keep the pots constantly moist, and don't wait until the plant dries out and keels over. Use some common sense, we have found it in some members of the community. A six-foot plant in a four-inch pot will have to be saturated almost every day. Large containers (10" width or more) should not be watered to saturation, especially if the plants are small. They will not dry out quickly enough and will encourage mould. Clay pots are porous and "breathe". They require more water than plastic or metal pots.

Don't disturb the roots when you water. Water around the stems, not on them. Seedlings are likely to fall over if watered roughly. Use a hand sprinkler with a fine spray for seedlings. When set on a coarse jet, these sprays are invaluable for discouraging cats from sniffing the seedlings.

Use tepid water, it soaks into the soil more easily and will not shock the roots. Try to water during the plants morning hours. Water from the top of the pot. Refill the watering container then, and leave it ready for next time. Not only will it all be ready, but the water will be at room temperature, and most of the chlorine will have evaporated (see later).

Water from the top of the pot. If you insist on watering from the bottom with trays, place a layer of gravel or pebbles in the trays to ensure drainage. Don't let the pots sit in the water until the soil becomes super-saturated. This prevents oxygen uptake and the plants will grow poorly.

The tap water in some areas is acidic (sulphurous) or alkaline (limestone) and can change the soil pH. If you are in such an area, check the pH every week or so.

Tap water in some locales is highly chlorinated. The chlorine does not harm the plants, but it can kill the micro-organisms in the soil that are necessary to break down nutrients to a form that the plants can use. Allowing chlorinated water to stand overnight will eliminate most of the chlorine gas and it can then be used safely.

Thinning

Depending on the viability of the seeds, you will have a germination rate of 0-100 % and several plants should be growing in each pot. During the second to fourth week of growth, the plants will begin to crowd each other. Thin your garden so that one plant is left in each container.

The marijuana leaf consists of 3-11 lanceolate shaped blades. These appear usually in odd numbers and the number depends on the genetic factors and growing conditions; principally the amount of light. The number of blades at the early stage is an indication of over-all leafiness at maturity.

To thin your garden, remove any plants with yellow, white or distorted leaves. Also remove the less vigorous ones, and those with the sparsest foliage. Leave the bushiest and those with the highest number of blades per leaf.

If the plants are close together, cut the unwanted plants at their base : the

root system can remain in the pot. Otherwise, make sure you do not disturb the remaining plants' root systems when you pull unwanted seedlings. Marijuana is very sensitive to that sort of thing.

The tops of these harvested plants will be your first taste of your homegrown grass. They will probably give you a mild buzz. The potency of the crop will increase considerably as the plants grow older.

Transplanting

If there are any pots without plants, you should transplant a seedling while you are thinning.

First, moisten the soil in the pot from which you will take the plant, and let it sit there for a few minutes. Take a spade or a large spoon, fish slice, wok scoop or something, and set it between the transplant and the plant that will be left to grow. Try to leave at least one inch of space from the spoon to the stem. Lever the spoon towards the side of the pot, so as to take up a good wedge of soil. Place the transplant in a prepared hole at the same depth that it was growing at before. Replace the soil in both pots, and moisten slightly to bond the new soil with the original. If carefully done, a wedge of soil can be removed intact, so the root system will not be disturbed and the plant will survive with little or no transplant shock. Do not fertilize a transplant for two weeks, and do not let them wilt.

To prevent drop-off and wilting from shock, you may want to use Rootone or Transplantone. These powders, available at garden stores, contain a root growth hormone and a fungicide. They are quite safe for our purposes.

Supports

Plants grown under artificial light will often need support, especially in the early stages of growth. Unlike sunlight on earth, the intensity of artificial light diminishes the further the distance from the light source. The plants respond accordingly, and try to grow up into the light. Hanging the lights higher up than the recommended six inches will further complicate this elongation. Too much red light will cause elongation too, so make sure that

you include a strong blue light if you are using traditional lightbulbs. The blue band will ease elongation somewhat, but the heaviest foliage will still be on top, and the stem may not be able to support the weight.

Depending on the plant size, pipecleaners, plastic straws, chopsticks or standard plant stakes can be used. Set them in the soil and tie the stem to it with string or wire twists like those that come with freezer bags. Do not tie too tightly around the stem, leave it very loose. Marijuana is a dicot, and will grow in girth as well as length. Tying the string too tightly can cut off the flow of water and nutrients as the stem grows larger.

Probably the simplest method of support is to take a rigid piece of wire, form a 'C' at one end, bend the 'C' at a right angle to the stem, push the straight end of the wire into the ground and carefully place the stem inside the 'C'. Wire pipe cleaners are ideal for seedlings. With larger plants, coat hangers can be straightened out and the same method used on a larger scale.

Fertilizing

As the plants grow, they take nutrients from the soil. These nutrients must be replaced if the plants are to stay healthy and strong, and to maintain a rapid rate of growth. The main elements are nitrogen (N), phosphorous (P) and potassium (K). These are the three mystic numbers listed on the sides of fertilizer packets: for example, 5-10-5. Calcium, magnesium, sulphur and iron are used in much lesser amounts, as are minute quantities of many other elements called trace elements or micro-nutrients. Each element affects different characteristics in the plant and all are necessary for healthy growth.

Nitrogen promotes rapid growth, lush foliage and stocky plants. During the first few months of growth, marijuana needs a lot of nitrogen. An abundance of nitrogen during the early stages will induce more female plants to develop. Obviously, there will be more males if there is a shortage of nitrogen.

Phosphorous promotes root growth, and is necessary for healthy flower and seed development. When flowering, marijuana uses about twice as much phosphorous as it does during normal, vegetative growth.

Potassium regulates the utilisation of the nutrients by the plant. It increases the vigour, strengthens stems, improves resistance to diseases, and

is essential for proper plant metabolism. The plant needs large amounts of potassium during all stages of growth.

Calcium aids in the absorption of nutrients, neutralises soil acids, and destroys some of the toxic compounds produced by the plant.

Testing the soil periodically is the surest way of maintaining a healthy growing medium. Soil that tests high in nitrogen and potassium, and medium in phosphorous will not have to be fertilized for a while. Soils found deficient in one element can be treated with a single component fertilizer.

When and how often to fertilize depends on the growing medium you started with, the size of the pots, the health of the plants, and general growing conditions. Normally, small pots (4 to 6 inches) should be fertilized about three weeks after sprouting. Fish emulsion (5-2-5, for those who know the magic numbers) is a good organic fertilizer. Dilute one teaspoon per gallon of water and use each time you water for the first two months, and once every two weeks thereafter. Chemical fertilizers such as Rapid-Gro (23-19-17), Phostrogen, or Miracle-Gro (15-30-15) can be used in accordance with instructions listed for houseplants. Don't use fertilizers recommended for "acid-loving plants", and never add solid fertilizers such as cow manure once the plants have started. They promote moulds that can do a lot more harm than good.

Large pots (10 to 18 inches) need not be fertilized at all if the soil was rich in nutrients to begin with.

Soil-less mixtures must be treated with a trace element mixture. Mix one tablespoon per gallon of water the first time you water. Every six weeks later, water with one teaspoon per gallon. Increase the treatment if the plants show any trace-element deficiencies.

You can use any houseplant fertilizer. These also contain trace elements. An ideal formula ratio for producing the most desirable results at each of the stages of the plant's life (rapid growth and profuse foliage in the beginning, and good development during middle life, with high resin content during flowering) is as follows:

N=Nitrogen, P=Phosphorous, K=Potassium

	N	P	K
Start (2nd week)	20	5	15
2 months before flowering	10	5	15

During flowering

5:12:10

It is not necessary to fertilize in these ratios, only that the plants receive enough of each element.

Use one tablespoon of micro-nutrient mix to each gallon of water during the first week, and thereafter use once every six weeks.

One week after sprouting, water with fertilizer in dilutions recommended on packages for large bushes and tomatoes. Repeat this application in the third, fifth, and eighth weeks. Thereafter, fertilize in dilutions recommended for houseplants once every two weeks until flowering starts.

Some words of caution: Many people, in an effort to do the best for their plants, actually do the worst. Over-fertilizing will put excessive amounts of soluble substances into the soil. They interfere with normal nutritional processes and will cause poor growth and, in some cases, kill the plant.

For example, too much nitrogen will nitrify the soil and change its osmotic properties. Instead of moisture being drawn into the plant, it is drawn away and the plant dehydrates. In the limited area that your plant is occupying, it is easy to overfertilize. If the plant looks healthy, and is growing well, don't be anxious to fertilize. It is better that they are underfed rather than overfed. Underfeeding can be recognised and corrected, but with overfertilization, you must start another crop and replace or leach the soil mix. It is better to use a diluted solution more often than to give one large dose once a month.

Foliar feeding (spraying the leaves with fertilizer) is a good way to assure the plants their nutrients without building up soluble substances in the soil.

After the first month, foliar feed the plants with fish emulsion or the chemical fertilizers. Some of the chemical fertilizers are not recommended for

foliar feeding houseplants. Marijuana is not a houseplant. As long as the fertilizer can be used for foliar feeding, use it on your plant. Use a fine mist sprayer, they don't cost much and you should have one for watering your seedlings anyway. Dilute fish emulsion to one teaspoon to a gallon and use each time you water. Spraying with fish emulsion is a little smelly and may

change the flavour of the grass to a pleasant mint-like flavour. Dilute the chemical fertilizers according to the directions on the packet, and spray weekly.

The nutrients are absorbed through the leaf surface (both sides) and through "breathing holes" (stomata) in the leaves. Occasionally spray with plain water to redilute unabsorbed nutrients and to clean the plants.

If any plant has an unhealthy or discoloured appearance, make sure the problem is not due to insect or disease before assuming a nutrient deficiency. Examine the plants carefully, especially the undersides of leaves, along the stem and in the soil.

Deficiency signs:

Nitrogen: plant colour is paler than normal. Yellowing of older leaves on the main stem followed by yellowing of younger leaves with slow or no growth. Yellowing of the leaves will occur after the plant is more than two and a half feet tall since they are shielded by the upper leaves or are too far from the lights to carry on chlorosynthesis.

Phosphorous: leaves are unnaturally dark green with slow growth. Poor flowering and root structure.

Potassium: leaves are unnaturally dark green and curl under the edges. Bronzing or yellowing starting on the edges of the older main stem leaves, which then turn grey, followed by grey or bronze mottling of the whole leaf. Stems are often soft and weak. This is the most common deficiency in indoor plants.

The following deficiencies are not common; especially if you are using fertilizers. If the plants are growing poorly, check the soil pH and drainage. If the water stays in a pool and takes more than a minute or so to be absorbed, then the soil is not draining properly. Leaves will brown at the tips, turn pale or yellow and severely curl.

Calcium: growing tips wither and wilt. Buds may not develop.

Sulphur: young leaves have veins of light green.

Magnesium: older leaves are pale green or yellow, this soon spreads to the whole plant.

Iron: young leaves are light green or yellow. Veins are darker green than surrounding tissue giving leaves a varicose vein appearance.

Boron: young leaves are constricted and light green.

Zinc: abnormally small leaves with yellow or wrinkled edges. Sometimes spotted. Sparse foliage, often having leaves at the top of the plant only.

Manganese: bleached out spots on the leaves.

Chlorine: general yellowing of leaves that turn copper or orange. Roots are swollen at the ends.

Molybdenum: young leaves are distorted. Sometimes there is a yellowing of leaves in the middle part of the plant.

Flowering

It is virtually impossible to recognise the gender of marijuana plants until they begin to flower. The male plant is usually the taller and matures in three to five months. Two weeks prior to flowering it will grow very fast (internodes elongate) then shoots will sprout with clusters of small, dangling, white, greenish white, yellow or purplish flowers that hang from tiny branches along the main stem, on branches at the top of the main stem. When mature, the flowers open and a yellow anther protrudes and wind disperses the pollen.

The female plant, although shorter, is fuller, with more complex branching and often twice as many leaves as the male. Her flower consists of a delicate, downy white stigma raised in a "V" sign, which is attached at the base to an ovary that looks like a tiny green pod. If fertilized, one seed will develop in the ovary. When allowed to grow, the flowers develop into clusters or "cones" which are interspersed with small green leaves known as bracts. The female is the more desirable plant for marijuana cultivators since it produces many more leaves, and is considerably more potent than the male.

Normally, male to female ratio in marijuana is about one to one. Genetic and environmental conditions interact to determine gender. A strong light source, long photoperiod, abundant nitrogen in early growth and much spacing between

plants stimulate female development. Poor growing conditions in general, such as weak light, low nutrient availability, short or erratic photoperiod and crowded conditions will produce more males.

Rotation and Even Growth

The light intensity from artificial light drops dramatically as distance from the light source increases. If you don't keep the plants at about the same height, the shorter plants will receive less light and consequently will grow more slowly than the tall ones. This will compound the problem.

One way to deal with uneven growth is to line the plants up by height and hang the light system at an angle corresponding to the line of the plant tops.

If a few of your plants are markedly outgrowing the others, cut the growing tip back to the height of the average plant. You may find this emotionally difficult, but is all-important to the over-all health of your crop. Cutting the top will not hurt it, but will force side branches to develop. Conversely, if a few plants are much shorter, raise them by placing them on milk crates or bricks. Don't put them on cardboard boxes: They collapse when wet.

Young plants about two weeks old can be cut back. This forces branches to develop early and will quickly fill all available horizontal space. It is helpful with large pots where there is much space between young plants. Growing tips of branches can be cut back to encourage more branching. This produces a stout bushy plant, and provides an immediate supply of grass. Don't overdo it. Severe pruning can cause plants to develop into males.

The growing tip of the plant (apical meristem) contains an inhibitor that prevents the branches (lateral buds) from growing. The further a lateral bud is from a growing tip, the less the effect of this inhibitor. This is why some species of plants form in the shape of a cone or christmas tree. Under artificial light the bottom branches don't receive enough light to grow, even though they are far enough from the inhibitor. Once the tip is removed, the next highest growing tip will be the source of the inhibitor.

Some growers hate to cut the growing tip. It becomes the biggest and most

potent cone at harvest time. To save the tip, control height, and force branching, bend the top of the stem down in an arc and secure it with string or wire twists. This will neutralise the effects of the inhibitor somewhat and still maintain a strong growing tip. The string or wire twist should be removed after a couple of days so that the stem will not break itself by twisting upward to the light source.

The quality and quantity of light emitted by a fluorescent is not uniform along the length of the tube. There is more light at the centre than at the ends. Female plants require more light than males. She is the more potent plant and should be given the best care. Once the plant's sex shows, move the males to the ends of the system, leaving the stronger middle light for the females.

Photoperiod

Many plant functions are regulated by the quantity and quality of light, and the length of the photoperiod (daylength). Marijuana is a short day (long night) plant. The female produces flowers only when she senses the decrease of daylength. In the autumn the shortening day is her signal to flower and produce seeds for the next year's crop before winter sets in. Flowering in the male does not depend on changes in the photoperiod. It flowers regardless of daylength in three to five months, depending on the variety.

Although termed 'short day', it is during the night period that the chemical reactions that control flowering occur if given a long enough and uninterrupted dark period. The dark period must be constant and at least nine hours long for the chemical buildup to be completed. By changing the light period to less than 13 hours a day, the female responds by flowering profusely in about 2 to 3 weeks. Females grown with a daylength of 16 or more hours may flower, but will do so sparsely, and will not develop large flower clusters. The longer the photoperiod the more pronounced this effect.

Before flowering, the leaf growth will be very fast. Once flowering begins, the plant's energy goes to producing the flowers, and the leaf growth slows. With this in mind, you can manipulate the photoperiod for either a continuously growing vegetative state, or for flowering and a harvest crop.

The continuous growth system emphasizes leaf growth and a continuous supply of gross. You can harvest the first grass, which will give you a buzz or better in about two months, and have a steady supply of potent grass after about four months. A one by four foot system will supply several joints a day. The grass is not quite as potent as the harvest system, but will be of excellent quality and will compare favourably with most commercial pot. The system is easy to care for and supplies a large amounts of grass over a period of time.

The harvest method produces a crop every 4 to 9 months. The grass is very potent and is at least as good as the best commercial pot. Although you may gather a few leaves now and then, you'll have to wait until the crop is harvested for a large supply. The system should produce a minimum of one ounce of pot for each square foot of growing area. Of course, you can always be enjoying the produce of the last garden while growing the current one.

Continuous Growth System

Use Vita-Lite, Optima, Wide Spectrum Gro-Lux, or combine Plant-Gro or Gro-Lux in a one to one ratio with daylight tubes. The abundance of blue light will emphasize leaf growth and not flowering. Do not use traditional lightbulbs. The photoperiod should be kept constant at 18 hours of light a day for the duration of the garden.

After two months the plants will be stocky and the area filled with foliage. At this time the bottom leaves begin to yellow because they are shielded from light or are too far away from it to carry out photosynthesis. Pick any leaf as soon as it begins to yellow. Green leaves can also be picked sparingly along with some of the leaf buds.

Flowers may develop after four months on a few plants and can be picked just above the growing tip. New flowers will soon develop. Continue picking the flowers until the plant loses its vitality. Females usually will continue to grow for more than a year, but may lose their vitality after about 8 or 9 months. When a plant's health begins to decline, it should be uprooted and new plants started in it's place. Seeds can be started or cuttings takey3 inches

below the growing tip of a healthy plant. Use cuttings only when you have an especially fast-growing or potent plant. Root the cuttings directly in the soil, using a transplant hormone such as Rootone, or Transplantone. Expect a survival rate of 30 to 50 per cent. Do not fertilize cuttings for about two weeks. The light system at this time will be quite high, so place the pots on some sort of platform. In this way, your garden will be kept in a continuous growing state with plants at different stages of growth giving you a constant supply of potent grass.

If you decide to start over completely, or close the garden down, adjust the photoperiod accordingly and convert to a harvest crop.

Harvest System

Under natural conditions, the female plant adjusts its flowering to the length of the growing season. This is generally between 3 and 7 months, depending upon region and time of planting. Once the plants go to seed, they usually lose their vitality and soon die. Since you will be controlling the flowering mechanism, your females can be anywhere between 2 and 9 months old at harvest time. The potency of grass in general increases with age as long as the plant stays healthy. We have found a happy medium in terms of potency and yield is to harvest about every 6 months.

Keep the photoperiod constant at 18 hours of light a day until 6 to 8 weeks before you plan to harvest. Then cut the day cycle down to about 13 hours of light. In about 2 weeks, the females will begin to flower. Allow the flower clusters to grow for another 4 to 6 weeks so that they can develop into the large clusters which are by far the most potent part of the plant. Flowers can be harvested 2 or 3 times before uprooting the plant. Pick them just above their growing tip where they meet the main leaves. New flowers will grow from this point giving you a higher yield of top quality grass.

Once the flowers have developed, you might try a sunlamp for an hour or two a day at a distance of three feet to force resin to the flowering parts. The

resin flow is the plants protection against the intense heat and possibly the ultra-violet rays. The resin contains the cannabinoids (THC) that make you high.

There is some discussion between growers about the effect of ultra-violet light on resin production. Some insist that it stimulates resin flow, while others claim little or no effect. Two things are certain: large amounts of ultra-violet can damage the plants, and you can grow high quality grass with or without ultra-violet. Another belief is that nitrogen deprivation stimulates resin production while others say that a dry medium is most important. Nitrogen uptake is minimal in dry soils it really doesn't matter to the marijuana grower which is the actual mechanism. Hold watering to a minimum and keep the atmosphere as dry as possible during the flowering period. Cut holes in your reflectors, or wedge open your cupboard door so that the humid air can escape. The dry atmosphere and soil will force more resins onto the flowering parts.

After turning down the light cycle, if there is a space between the plants, hang traditional bulbs in these gaps. These will stimulate the side branches to develop, which will fill all the available space. The output of these lights is mostly in the red part of the spectrum which will cause profuse flowering. Care should be taken that they are not hung too close to the plants, where they may cause burning of the leaves. For a 40 watt bulb, a ten inch gap will be quite safe - larger bulbs require more distance. For a more even distribution, use several small bulbs rather than one large one. Heat given off by a fluorescent and by a more traditional bulb is about equal for equal wattages. Heat radiated by a fluorescent is spread out over the length of the tube and will not burn the leaves unless left in direct contact for a number of hours.

You can expect a minimum yield of about one ounce of pot per square foot of growing area. Large pots give fewer but taller and bushier plant. The total yield is similar for 6" to 18" pots. 8 to 10 inch pots are a good median size for high-yield, high potency grass from a moderate amount of soil. Allowing much more than 1 1/2 feet of growing area per plant will cut down on the yield

of the system.

Temperature and Humidity

Temperature control should be no problem. The plant grows well at room temperature (70 to 80 degrees during light hours, 55 to 65 degrees during darkness), and will survive in temperatures from 40 to 100 degrees. By the way temperatures are in fahrenheit. Centigrades ? I treads on 'em.

Plant growth is closely related to temperature. The rate of photosynthesis increases until the temperature reaches about 75 to 85 degrees depending on the variety. As the temperature rises above this level, the rate of photosynthesis slows, and cannabiol resins develop. During flowering, plants grown in high temperatures (85 to 100 degrees) and low humidity will produce more resin, while during growth stage plants grow faster at room temperatures and medium humidity. For this reason it is a good idea to start your crop so that you'll harvest during winter months when the heat is turned on. Heated homes have a very dry atmosphere.

Propane catalytic heaters do a very good job of heating, are safe, clean, and increase the (O₂ content of the air. Electric and natural gas heaters also work well. Do not use paraffin or petrol heaters. They do not burn clean, and the pollutants may harm the plant.

At high temperatures and humidity, air should be allowed to circulate freely throughout the garden. Gardens in small confined spaces such as wardrobes must be opened daily or the atmosphere will become stifling and growth rate will slow down. Constant air circulation does not seem to be critical with marijuana as long as the plant obtains its CO₂. If you have a large garden and there is no way for air to circulate, place a small fan in the garden.

Carbon Dioxide

Plants take in carbon dioxide (CO₂) and release oxygen (O₂) during photosynthesis while at night, plant cells respire by taking in O₂ and releasing CO₂. The net result is that much more oxygen is produced than is consumed.

Carbon dioxide concentration in the air is very low (about 0.3%). Around large

cities it is a little higher. Plants can use much more CO₂ than is supplied by the ordinary atmosphere. In general, the rate of photosynthesis increases in proportion to the CO₂ content of the air up to about 0.5% as long as there are no limiting factors such as inadequate light or water.

Tanks of CO₂ can be used to increase the concentration in the air. Periodically, disperse the gas above the tops of the plants. CO₂ is heavier than air and will move slowly downwards.

Hybrids

As you become more familiar with the marijuana plant, you may want to develop your own strain by crossing selected plants. Plant seeds from as many strains as possible. The growth pattern will vary considerably and you can select one male to go to flower and fertilize particular females. Factors for selection might be potency, high yield, rate of growth, number of leaves or just pure aesthetics. All males except the selected one must be removed before their flowers open. Place the selected females around the male plant. Periodically shake the male or fan the air about the male's flowers. The pollen will disperse in a fine mist over the female flowers. This method should be adequate to produce enough viable seeds for your next crop. After a few generations you will have your own strain, well-suited to its environment and your taste.

Hermaphroditic plants are not unusual with marijuana. Some are genetically determined (protogenous) while others are a reaction to a hostile environment (most likely the photoperiod). An irregular or prolonged photoperiod can cause this. These plants have only female flowers at first. Male flowers appear later at the top of the stem and branches. Protogenous hermaphrodites develop male and female flowers more uniformly with female flowers above male flowers on the same branch.

Hermaphroditism can be used to develop a male-free crop. All male plants must be removed before they go to pollen. Collect the male flowers from a hermaphrodite when they are a good size but have not yet opened. Store the flowers in sealed vials (a glass covered with cling-film is fine). In a few days they will open up. Apply the pollen with a fine brush or cotton bud over

the stigmas (a white 'V'-shaped thing) on another female's flowers. Wait a few weeks until the seeds are full and have good colour before harvesting. The next generation will be all females or all females and hermaphrodites.

More serious growers can try grafting hops plants to marijuana stalks to produce a possible legal plant, using growth hormones such as gibberilic acid or mutating polyploids using colchicine, thio-ethers, or other chemicals. Methods for these are discussed in the following:

The Cultivator's Hand book of Marijuana by Bill Drake

Super Grass Growers Guide by Mary Jane Superweed (Stone Kingdom)

Bark Leaf- (Summer 1972) - Available from: Church of the Tree of Life, 451 Columbus Ave., San Fransisco, California 94133

Hop seeds can be obtained from various Real Ale and other brewing societies.

Curing Your Grass

All leaves must be thoroughly dried for comfortable smoking and full potency. The THC in fresh grass is mostly present in the form of non-psychoactive tetrahydrocannabinolic acid. Upon drying, the acid is converted into THC by decarboxylation.

Single leaves can be dried by placing them in a pan on a hot radiator or in the bright summer sun (a little scarce in Britain). A quicker method is to pre-heat your oven to 150 degrees. Place a single layer of leaves in a pan, turn off the oven and place them inside. In five to fifteen minutes the leaves will be dry and will crumble easily between your fingers. If not dry, remove the grass from the oven and repeat the pre-heating and drying. You can also put them in single layers, propped up on chopsticks or somesuch, on full for a few minutes.

Another method is to hang the plants intact, upside down above a radiator, or in the sun. Some of the resin contained in the stem will ooze onto the leaves. It will take 3 to 10 days to dry completely, depending on the humidity and other factors. The potency of the grass varies in different parts of the plant. Potency increases from the bottom to the top. The small leaves on the branches are more potent than the large leaves on the main stem, and the

flowering parts are the most potent of all. The female plant is always considerably more potent than the male. The best part is the flowering top of a female plant, and the worst (which is really not bad at all) is the large leaves on the bottom of the stem of the male.

Large Systems

With the price of grass what it is today, some of you may want to undertake growing on a large scale. To get the highest yield for the smallest investment requires a conservation of light and soil. During the first few months of growth the plants need much less soil and garden space than they do when they are older. You can design a system that will produce large, mature plants to harvest every month, by having in each system six sub-systems at different growth stages. For example, 50 plants need a minimum of 50 square feet of growing room when mature, but during the first month they will fit inside of 2 square feet. During the second month they will need approximately six square feet.

If the plants are started in large pots, the pots themselves take up most of the room. This wastes light and soil on empty space. By rotating the plants into bigger gardens and successively larger pots, you can get the highest yield from a minimum investment. Transplanting to larger pots is easy. The root systems quickly fill the pots and can be removed intact with all the soil adhering to the roots. This is best done by turning the pot upside down and placing the plant stem between the middle and index finger, then tapping gently on the bottom of the pot with a something you can get a good swing with. The plant will just pop out of the pot.

For smaller gardens, use industrial type light fixtures. Larger systems should have single tubes, evenly spaced, and mounted on plywood. Big systems can get very heavy because of the weight of the transformers. It is more convenient and cheaper if you don't buy fixtures, but only the end sockets and transformers.

Mount the transformers separately and run extension wires to the light system. With only the sockets and tubes mounted on the plywood, the lights are easily

raised and there is less weight for the walls and ceiling to support.

For larger systems it is better to use very high output tubes. These have a higher intensity than regular fluorescent tubes, and their effective distance is so much more that fewer tubes are needed and they can be placed further apart. The closer the tubes are placed to each other, the less efficient the lights are. Light from one tube may just hit the neighbouring tube and be lost.

It is well worth it to grow all-female crops either by taking cutting or by hybridising hermaphrodites when building these systems.

A three garden/two month system is given as an example, but the idea can be simply extended to a six garden, one month system.

A. The first two months - Plants are started in sixty-five 4" pots within approximately eight square feet. Using 20 watts of light per square foot (PSF) you are using 160 watts from two 8 foot tubes (72-80 watts each)

B. The third and fourth months - Transplant to 6-8" pots. The system uses approximately 32 square feet. Using 20 watts PSF, you are drawing 640 watts from eight 8 foot tubes or 3 VHO tubes (215 watts each).

C. Fifth and sixth months - Option to transplant to 10-14" pots within approximately seventy square feet. Using 20 watts PSF you are drawing 1400 watts from seventeen 8 foot tubes or 7 VHO tubes.

Maintenance and Restarting

Periodically you should clean the tubes and reflectors to remove accumulated dust and grime or else the amount of visible light produced will be cut. Most fluorescents lose about 30% of their effective power after about a year of use. They should be replaced when dark rings appear at the tube ends. Replace traditional bulbs after five hundred light hours.

Don't smoke around the plants. Heavy concentrations of tobacco smoke are harmful to marijuana, especially to the male plant.

Visiting your garden will be good for both you and your plants. You'll provide them with CO₂, and they'll provide you with oxygen rich air.

To start a new crop, it is best to begin with fresh soil, especially if you had been using a system with smaller pots and frequent fertilization. A buildup of toxic salts can harm new plants. To salvage large quantities of soil, remove the top two-inch layer of soil, which contain most of the harmful salts. Treat the rest of the soil with a trace element mixture, add fertilizer and fresh soil. Thoroughly mix and repot in clean sterile pots.

Insects and Diseases

The indoor garden is an ideal habitat for plant pests. There should be little chance of a problem if you start with sterilized soil and keep the garden segregated from other plants. Before planting, make sure that none of your other plants are infested with anything.

Over-watering often causes plants to lose their vitality, develop drooping and spotted leaves. Sometimes they succumb to fungus or stem rot. Stem rot appears as a brown or black discolouration at the base of the stem and is soft and mushy to the touch. To correct this allow the soil to dry more before watering and be sure to water around the stem, and not on it. Wipe fungus and stem rot off the plants and treat them with a fungicide.

Spider mites and false spider mites are the most common and destructive pests. Both species are barely visible to the naked eye, and are usually well established before you discover them. First indications are chlorotic or whitish leaves or bronzing of the edges along the veins. Webs form at the internodes of the stem and along the branches. the cyclamen mites are oval, tan to black, or semi-transparent. Eggs are white and laid along veins on the undersides of the leaves. False spider mites are bright red. You can usually see mites as tiny specks if you look up at the light system from the underside of the leaves.

Mites are difficult to eliminate. If only a few plants are infested, remove and destroy them immediately. The other plants must be treated with an insecticide such as Malathion. Malathion is an organic phosphate which is effective but very toxic. However, it breaks down chemically and is metabolised into harmless chemicals after 14 days. Do not harvest before at least 14 days have gone by from when you spray.

When using Malathion, add one-half teaspoon of mild detergent (not soap) to each gallon of the solution. The detergent will help spread the insecticide more thoroughly over the plant. If the plants are large, spray the whole plant, especially the undersides of leaves and soil surfaces. The spray kills the adults, but is ineffective against their eggs. Repeat this application weekly for the next few weeks and you'll catch the young mites after they've hatched but before they've laid eggs.

Be extremely cautious when using insecticides. You are going to smoke or ingest the plant, and don't want to poison yourself along with the insects.

There are a number of insecticides such as Diazinon and Malathion on the market which are safe when used as directed. The label will list the precautions and give time periods for degrading before consumption. If you have a pest problem which we haven't described, your local nurseryman or woman should be able to describe the proper treatment ("Me tomatoes are poorly, Guv."). Smaller plants should be dunked in a bucket of the solution, which is the surest way to kill the pests.

If the plants are not heavily infested and you object to Malathion, wash them in soapy water, one quarter pound of pure soap (such as Ivory Flakes) to one gallon of tepid water. Mix the soap thoroughly into the water and, without letting the soil fall out of the pot (cover it with newspaper, foil, or cling-film) invert the plant and dip it several times. Let it drip dry, then rinse in clear water. The dunking procedure may have to be used repeatedly since it is almost impossible to wash all the mites off at once.

Mealy Bugs are larger (about 3/16") and white. They are usually found on the underside of the leaves or near the stem. The eggs are contained in a white cotton-like or waxy material at the stem internodes or leaf axils. The infested plants will need more frequent watering and will have a weakened appearance.

Aphids ("little green junkies") are about 1/16" long and are green, red, pink or black. They have roundish bodies and antennae and long legs. Some species have wings. They congregate on the underside of leaves, especially young, juicy, tender leaves. Growth becomes stunted and leaves are curled or distorted. Mealy bugs and Aphids are not as common a problem as mites, and are

easier to deal with. Remove infested plants from the garden. Dunk them in a solution of 1/4lb of soap per gallon of tepid water. Use a cloth and go over the underside of the leaves with a cotton bud to remove the pests. When using Malathion, one application to the whole crop is usually enough to prevent these pests from recurring.

Whiteflies are white (obviously) and about 1/16" long. The young appear as green or yellow scales. Usually you don't see whiteflies until the plants are moved. Then all the adults take off and it looks like a small snowstorm. Plant growth is slow and leaves are often sticky with the insects excretions. A thorough spraying with Malathion will usually get rid of whiteflies.

For winged insects in general, spray-on insecticides using Pyrethium are convenient. They are not as effective as Malathion, but the toxic effects of the spray usually wears off after a day or two.

For further information on pest control:

The Natural Way to Pest-Free Gardening by Jack Krammer, New York City - Charles Scribner's and Sons - 1972

Organic Way to Plant Protection - Emmaus P. A., Rodale Books Inc. 1966

Outdoor Cultivation

The Outdoor Garden

Marijuana is usually an annual plant. This means that the life expectancy of the plant is based on the length of the growing season. The longer the growing season, the better the quality, and the larger the quantity, of your crop.

Marijuana should be planted outdoors two weeks after the last threat of frost, and should be harvested before the first autumn frost. You can find the approximate dates for your area by consulting experienced growers, nurserymen or gardening magazines.

Some fields are warmer than others in the same area, because of the way they lie and prevailing wind conditions. Northern slopes are the coldest and receive the least light. Southern slopes receive the most light and are the warmest. Eastern slopes are shaded in the afternoon, and western slopes are shaded in the morning. The steeper the slope, the more pronounced is the shading.

Precautions

Naturally you will want to be careful where you grow your crops. Make sure that there is no visible access from a road or well-used path. Since marijuana may grow to twenty feet (depending upon variety, length of growing season, soil conditions and light) it might be best to intersperse it with other tall plants such as staked tomatoes, corn and sunflowers. Find out what kind of fields the growers in your area are using. An area that grows over with tall weeds will most likely grow good grass if you start the marijuana before the weeds come up.

An ideal planting area is an open clearing in a woodland not frequented by the general public. The clearing should be located so that the plants get at least eight hours a day of direct sunlight. Other possibilities are clearings on mountains, depressions in fields, or clearings in giant fields not under aerial supervision.

Remember that grass cannot be easily moved once it is planted and that it will probably remain there for at least four months.

There have been a number of incidents of hunters discovering patches of marijuana and reporting it to the law. Try not to plant on land frequented by hunters.

Growing Conditions

Marijuana likes as much sun as it can get, and a moist but well-drained soil. It does not do well in swampy and clay soils. The soil should be high in nitrogen and potassium and medium in phosphorous. The pH should be at least 5.5; it will do better at 6.5 - 7.5.

At least two months before planting you should test and adjust the soil. Needed nutrients should be added to the soil at least a month before planting for the best results. This gives the fertilizer time to dissolve.

The pH can be raised by adding ground limestone, dolomite limestone, hydrated lime, marl or ground sea shells.

Sandy and loamy soil can be conditioned just by adding fertilizer and making

pH adjustments. Nurseries carry several different fertilizer mixes. Select one closest to your needs as determined by the soil tests. Some Agricultural Colleges will do these tests for you.

Turn and loosen the soil and break up large clods of earth. Clear all ground near the spot where you are planting. Add fertilizer and work it into the ground. If it rains frequently in your area, the fertilizer will soak into the ground by itself. If no, water the area so that it dissolves.

Clay soils can be adjusted by working in straw, manure, leaves and stalks, compost, kitty litter or construction sand. These help to keep the soil loose and aerated.

Swampy areas can be adjusted by building planting mounds about one foot high and one foot across. The mounds will have better drainage than the surrounding soil and they will not become waterlogged.

If the soil is very bad and you are only growing a small patch there are other ways of changing soil conditions:

1. Buy topsoil and place it in holes where you are going to plant. This is only for small gardens as it can be expensive and laborious.
2. Dig a hole one foot deep and one foot wide. Fill in six inches deep with manure or compost sprinkled with lime. Fill the remainder of the hole with soil.
3. Use a self-contained planting pot as described in Transplanting.

To get a longer season, you can start seeds indoors and transplant them outside after the threat of frost has passed. This is especially helpful in the Northern US, NZ South Island and Sunny Britain, where the growing season is short. Seeds can be started as much as two months before the season begins. There are several methods for starting seeds:

1. Planting Pellets. These are one and a half inch pellets which expand when they come in contact with water. They come in several pH levels. Get either a 6.5 or a 7. These are the easiest units for starting seedlings. Just follow the directions on the package. They should be used only if you are planning to plant within a month.

2. Planting Pots. These pots are made of compressed peat moss. They come in all sizes, but the best is probably 2" X 2". Fill with one of the soil mixtures described in Indoor Cultivation. Try to prepare from the same soil to which the plants will be moved later. Plant several seeds in each pot and thin to one plant per pot. When you are ready to transplant outdoors, just dig a hole and put the planting pot in it. The pot will disintegrate when the root system gets big enough.

Tin cans and toilet rolls can be used instead of planting pots. Make sure the cans have drainage holes in them and that the sides are scored so that the roots can grow out of them. Do not use aluminium cans. They won't disintegrate and the plants roots will be trapped.

3. Seed Trays. Seed trays are the most economical way of starting large numbers of seedlings, but the plant's roots may be damaged when you transplant. Fill plastic planting trays with one of the mixtures described in Indoor Cultivation. Sow one seed every inch, but thin to one plant every two inches when they begin to interfere with each other. When you are ready to transplant them, slice the soil into squares and plant outdoors. Treat to prevent shock.

4. Self-contained Soil Unit. This method should be used only when the soil is unsuitable for adjustment. Use large cans. Fill with 3 inches of vermiculite or perlite mixed with a slow release fertilizer, and then fill it the rest of the way with a mixture of soil, perlite, vermiculite and sand. A mixture of soil, manure, humus, and potash can also be used. Holes should be punched in the bottom of the can for drainage. When you are ready to plant outdoors, put the can in a hole in the ground.

Use the same methods in cultivating these plants indoors as you would if they were to remain indoors permanently. If you are planning to keep the plants indoors for more than a month, they have to be introduced to the sun's intensity gradually. The plants need at least 40 watts of fluorescent light per square foot to avoid shock. This will also build up the sugar supply to help the plant avoid transplant shock. Other ways of avoiding shock are by

putting trays of seedlings outdoors for a few hours a day for a few days in a partially sunny area before they are transplanted.

If you have indoor plants already growing, you can clip shoots about 3 inches from the growing tip and put each of them in one of the containers mentioned previously. They will quickly develop roots and start growing into new plants, especially if a little hormone rooting powder is used. This is a good method of obtaining high quality transplant stock.

The night before you transplant, water both the plant and the soil to which you are going to transplant. Also, to prevent shock, transplants should be made to and from soils with the same chemical or textural characteristics (unless you are using the self-contained soil unit method).

Plant on a cloudy day or late in the afternoon. Never plant or transplant on a bright sunny day. The sun's energy is too much for the plants to take at first.

Spacing

Marijuana is very adaptable and can be grown as close together as fifteen inches between rows with plants every six inches. Plants grown this way will not be as bushy as ones grown further apart. Spacing rows 24 inches or so apart with plants about every fifteen inches seems to be the most efficient method of utilising the area. Plants will be bushy, tall and easy to harvest.

In order to catch as much sun as possible, rows should run north to south, perpendicular to the course of the sun.

Water

Marijuana cannot grow (or live) in an environment in which it cannot find water. It sends down a tap root which may grow to be half as long as the plant itself. Often marijuana can be found near the banks of streams in drier areas. Cultivated fields supply enough water naturally through irrigation. Some growers in remote areas use portable water pumps. Digging a hole in which the pump can be run and stored will muffle the sound and keep the machinery in

better condition. Make sure not to overwater your plants. Keep the ground moist, but not waterlogged.

Care

Grass is at its most vulnerable stage right after germination. The seedlings have a tendency to fall over in rain and wind. Usually they can overcome their crises. If you have started seedlings indoors, you will be over the critical stage when you come to transplant.

1 1/2 to 2 months after germination you will have to decide whether to clip the tops to make the plant bush or to let it grow straight and let it bush on its own. Letting the grass grow straight will allow it to produce more weed, but bushy plants are harder to detect. If you want the plants to bush, cut the main stem about three inches from the top when the plant is about 2 to 3 feet tall. Very long secondary branches should also be cut. The clipped tops can be dried and smoked, or they can be rooted. This process should be repeated if the plant starts growing tall again.

If you have prepared the soil properly you will not need to fertilize much (if at all) during the growing season. It is a good idea to check the plants periodically. If the plants seem to have any deficiencies, add the proper nutrients. If the plants are not growing quickly, make sure they do not have too much competition for sunlight. If the plants are too close together, they can be trimmed or pulled. If crowding is not the problem, pH probably is. Test the pH and make the proper adjustments.

Flowering and Harvesting

The plants will begin to flower late August or early September. When total daylight hours fall below 13-15 hours a day (depending on variety) the plants' reproductive cycle is triggered.

If you have a long growing season and secure conditions, pick the flower buds off. The plant will send up new buds. As long as the plant continues to send them up you can clip them off. Some say this increases the potency, it surely increases the yield.

Many farmers throughout the world bend the stem of each plant sharply at a point way down. The plants are left this way for several days after which the sun-dried tops are harvested. The bend cuts off circulation between the upper and lower parts of the plant. Cannabinol resins cannot flow back past the bend. Furthermore the shock of bending apparently drives the resins in the portion of the stem just above the bend into the flower tops.

Another technique is to bend the tops more or less horizontally so that they snap, but do not crease. The tops draw some liquids from the base of the plant, but not enough to stop them wilting within 10 days. People who use this method claim it increases potency significantly.

In many places, most notably in India and Pakistan, farmers make the practice of destroying all male plants as soon as their gender becomes determinable. This is done to prevent their maturation and the pollination of the females. It has been found that a loss of cannabinol resin often occurs in the female shortly after pollination.

If your growing season is short (as it tends to be in the UK), let the plants flower and harvest them before the frost. Some claim that marijuana is at its potency peak at this time. Others claim that marijuana is at its most potent state about 2 to 10 days after it starts to flower. Due to the difficulty of obtaining the necessary licenses from Government departments, very little real research has been done in this field.

If you wait until the seeds mature and drop off the plant, you may have a crop next year without planting. It is almost impossible to get rid of marijuana once it has become indigenous to the area. The American Federal Government in Iowa and Kansas have gone so far as to suggest that farmers napalm or herbicide their fields.

Marijuana can be harvested by pulling up the whole plant, including the roots, by chopping it off about 1/2 way up the stem, or by picking each plant separately.

Depending on cultivation methods and environmental conditions you should harvest about 1000-5000lbs per acre (43,000 square feet).

Recently, a crop of two acres worth of "the best grass we've ever seen" was found by the New Zealand police force. Right in the centre of Wellington. Too bad they got caught

Plant Pests Outdoors

Several different kinds of insects like to eat, chew or suck on marijuana. Several methods can be used to get rid of them. Companion planting of garlic, onions, chives, savoury, thyme and marigolds keep some insects away. Inter-crop one of these with your marijuana. (Interesting fact #247: Marijuana was once planted hash plants around their crops of cabbages as hash scares off the cabbage white butterfly. This practice has been since discontinued.)

Predatory insects such as the praying mantis, ladybirds, and lacewings eat insects which attack marijuana. They can be purchased from commercial hatcheries. Do not spray plants with insecticides of any description when predators are present. You'll wipe them out too.

Botanical repellents, naturally occurring insecticides which have not been concentrated, can be used in spray form. They are not persistent, that is, they do not build up in living tissue, but they are poisons. Pyrethiums and Rotenone are the ones used most often. Take care if using Rotenone near a river; people will get suspicious when all the fish drop dead.

Your plants are more likely to be attacked by foraging animals and hippies. Little can be done about the latter except choosing a better location, but blood meal placed on the ground near the garden will keep deer away. Chimes, bells and scarecrows keep foraging animals at bay, but attract the hippies. A stout fence is the only reliable answer.

One day, the powers that rely on our obedience may legalise cannabis in your country. Here's to that day.

Beginner's Guide to Growing Marijuana

Introduction:

Growing marijuana indoors is fast becoming an American Pastime. The reasons are varied. With the increased interest and experimentation in house plant cultivation, it was inevitable that people would apply their knowledge of plant care to growing marijuana. Many of those who occasionally like to light up a joint may find it difficult to locate a source or are hesitant to deal with a perhaps unsavory element of society in procuring their grass. There is, of course, the criminal aspect of buying or selling grass; Growing marijuana is just as illegal as buying, selling, or smoking it, but growing is something you can do in the privacy of your own home without having to deal with someone you don't know or trust. The best reason for growing your own is the enjoyment you will get out of watching those tiny little seeds you picked out of your stash sprout and become some of the most lovely and lush of all house plants.

Anyone Can Do It

Even if you haven't had any prior experience with growing plants in your home, you can have a successful crop of marijuana by following the simple directions in this pamphlet. If you have had problems in the past with marijuana cultivation, you may find the solutions in the following chapters. Growing a marijuana plant involves four basic steps:

1. Get the seeds. If you don't already have some, you can ask your friends to save you seeds out of any good grass they may come across. You'll find that lots of people already have a seed collection of some sort and are willing to part with a few prime seeds in exchange for some of the finished product.
2. Germinate the seeds. You can simply drop a seed into moist soil, but by germinating the seeds first you can be sure that the seed will indeed produce a plant. To germinate seeds, place a group of them between about six moist paper towels, or in the pores of a moist sponge. Leave the towels or sponge moist but not soaking wet. Some seeds will germinate in 24 hours while others may take several days or even a week.
3. Plant the sprouts. As soon as a seed cracks open and begins to sprout, place it on some moist soil and sprinkle a little soil over the top of it.
4. Supply the plants with light. Fluorescent lights are the best. Hang the lights with two inches of the soil and after the plants appear above the ground, continue to keep the lights with two inches of the plants. It is as easy as that. If you follow those four steps you will grow a marijuana plant. To ensure prime quality and the highest yield in the shortest time period, however, a few details are necessary.

Soil

Your prime concern, after choosing high quality seeds, is the soil. Use the best soil you can get. Scrimping on the soil doesn't pay off in the long run. If you use unsterilized soil you will almost certainly find parasites in it, probably after it is too late to transplant your marijuana. You can find excellent soil for sale at your local plant shop or nursery, Wal-Mart, and even some grocery stores. The soil you use should have these properties for the best possible results:

1. It should drain well. That is, it should have some sand in it and also some sponge rock or perlite.
2. The pH should be between 6.5 and 7.5 since marijuana does not do well in acidic soil. High acidity in soil encourages the plant to be predominantly male, an undesirable trait.
3. The soil should also contain humus for retaining moisture and nutrients.

If you want to make your own soil mixture, you can use this recipe: Mix two parts moss with one part sand and one part perlite or sponge rock to each four gallons of soil. Test your soil for pH with litmus paper or with a soil testing kit available at most plant stores. To raise the pH of the soil, add 1/2 lb. lime to 1 cubic foot of soil to raise the pH one point. If you absolutely insist on using dirt you dug up from your driveway, you must sterilize it by baking it in your oven for about an hour at 250 degrees. Be sure to moisten it thoroughly first and also prepare yourself for a rapid evacuation of your kitchen because that hot soil is going to stink. Now add to the mixture about one tablespoon of fertilizer (like Rapid-Gro) per gallon of soil and blend it in thoroughly. Better yet, just skip the whole process and spend a couple bucks on some soil.

Beginner's Guide to Growing Marijuana

Containers

After you have prepared your soil, you will have to come up with some kind of container to plant in. The container should be sterilized as well, especially if they have been used previously for growing other plants. The size of the container has a great deal to do with the rate of growth and overall size of the plant. You should plan on transplanting your plant not more than one time, since the process of transplanting can be a shock to the plant and it will have to undergo a recovery period in which growth is slowed or even stopped for a short while. The first container you use should be no larger than six inches in diameter and can be made of clay or plastic. To transplant, simply prepare the larger pot by filling it with soil and scooping out a little hole about the size of the smaller pot that the plant is in. Turn the plant upside down, pot and all, and tap the rim of the pot sharply on a counter or the edge of the sink. The soil and root ball should come out of the pot cleanly with the soil retaining the shape of the pot and with no disturbances to the root ball. Another method that can bypass the transplanting problem is using a Jiffy-Pot. Jiffy pots are made of compressed peat moss and can be planted right into moist soil where they decompose and allow the passage of the root system through their walls. The second container should have a volume of at least three gallons. Marijuana doesn't like to have its roots bound or cramped for space, so always be sure that the container you use will be deep enough for your plant's root system. It is very difficult to transplant a five-foot marijuana tree, so plan ahead. It is going to get bigger. The small plants should be ready to transplant into their permanent homes in about two weeks. Keep a close watch on them after the first week or so and avoid root binding at all costs since the plants never seem to do as well once they have been stunted by the cramping of their roots.

Fertilizer

Marijuana likes lots of food, but you can do damage to the plants if you are too zealous. Some fertilizers can burn a plant and damage its roots if used in too high a concentration. Most commercial soil will have enough nutrients in it to sustain the plant for about three weeks of growth so you don't need to worry about feeding your plant until the end of the third week. The most important thing to remember is to introduce the fertilizer concentration to the plant gradually. Start with a fairly diluted fertilizer solution and gradually increase the dosage. There are several good marijuana fertilizers on the commercial market, two of which are Rapid-Gro and Eco-Grow. Rapid-Gro has had widespread use in marijuana cultivation and is available in most parts of the United States. Eco-Grow is also especially good for marijuana since it contains an ingredient that keeps the soil from becoming acid. Most fertilizers cause a pH change in the soil. Adding fertilizer to the soil almost always results in a more acidic pH.

As time goes on, the amount of salts produced by the breakdown of fertilizers in the soil causes the soil to become increasingly acidic and eventually the concentration of these salts in the soil will stunt the plant and cause browning out of the foliage. Also, as the plant gets older its roots become less effective in bringing food to the leaves. To avoid the

accumulation of these salts in your soil and to ensure that your plant is getting all of the food it needs you can begin leaf feeding your plant at the age of about 1.5 months. Dissolve the fertilizer in worm water and spray the mixture directly onto the foliage. The leaves absorb the fertilizer into their veins. If you want to continue to put fertilizer into the soil as well as leaf feeding, be sure not to overdose your plants.

Remember to increase the amount of food your plant receives gradually. Marijuana seems to be able to take as much fertilizer as you want to give it as long as it is introduced over a period of time. During the first three months or so, fertilize your plants every few days. As the rate of foliage growth slows down in the plant's preparation for blooming and seed production, the fertilizer intake of the plant should be slowed down as well. Never fertilize the plant just before you are going to harvest it since the fertilizer will encourage foliage production and slow down resin production. A word here about the most organic of fertilizers: worm castings. As you may know, worms are raised commercially for sale to gardeners. The breeders put the worms in organic compost mixtures and while the worms are reproducing they eat the organic matter and expel some of the best marijuana food around. After the worms have eaten all the organic matter in the compost, they are removed and sold and the remains are then sold as worm castings. These castings are so rich that you can grow marijuana in straight worm castings. This isn't really necessary however, and it is somewhat impractical since the castings are very expensive. If you can afford them you can, however, blend them in with your soil and they will make a very good organic fertilizer.

Beginner's Guide to Growing Marijuana

Light

Without light, the plants cannot grow. In the countries in which marijuana grows best, the sun is the source of light. The amount of light and the length of the growing season in these countries results in huge tree-like plants. In most parts of North America, however, the sun is not generally intense enough for long enough periods of time to produce the same size and quality of plants that grow with ease in Latin America and other tropical countries. The answer to the problem of lack of sun, especially in the winter months, shortness of the growing season, and other problems is to grow indoors under simulated conditions. The rule of thumb seems to be the more light, the better. In one experiment we know of, eight eight-foot VHO Gro-Lux fixtures were used over eight plants. The plants grew at an astonishing rate. The lights had to be raised every day. There are many types of artificial light and all of them do different things to your plants. The common incandescent light bulb emits some of the frequencies of light the plant can use, but it also emits a high percentage of far red and infra-red light which cause the plant to concentrate its growth on the stem. This results in the plant stretching toward the light bulb until it becomes so tall and spindly that it just weakly topples over. There are several brands of bulb type. One is the incandescent plant spot light which emits higher amounts of red and blue light than the common light bulb. It is an improvement, but has its drawbacks. It is hot, for example, and cannot be placed close to the plants. Consequently, the plant has to stretch upwards again and is in danger of becoming elongated and falling over. The red bands of light seem to encourage stem growth which is not desirable in growing marijuana. The idea is to encourage foliage growth for obvious reasons. Gro-Lux lights are probably the most common fluorescent plant lights. In our experience with them, they have proven themselves to be extremely effective. They range in size from one to eight feet in length so you can set up a growing room in a closet or a warehouse. There are two types of Gro-Lux lights: The standard and the wide spectrum. They can be used in conjunction with one another, but the wide spectrum lights are not sufficient on their own. The wide spectrum lights were designed as a supplementary light source and are cheaper than the standard lights. Wide spectrum lights emit the same bands of light as the standard but the standard emits higher concentrations of red and blue bands that the plants need to grow. The wide spectrum lights also emit infra-red, the effect of which on stem growth we have already discussed. If you are planning to grow on a large scale, you might be interested to know that the regular fluorescent lamps and fixtures, the type that are used in commercial lighting, work well when used along with standard Gro-Lux lights. These commercial lights are called cool whites, and are the cheapest of the fluorescent lights we have mentioned. They emit as much blue light as the Gro-Lux standards and the blue light is what the plants use in foliage growth.

Now we come to the question of intensity. Both the standard and wide spectrum lamps come in three intensities: regular output, high output, and very high output. You can grow a nice crop of plants under the regular output lamps and probably be quite satisfied with our results. The difference in using the HO or VHO lamps is the time it takes to grow a crop. Under a VHO lamp, the plants grow at a rate that is about three times the rate at which they grow under the standard lamps. People have been known to get a plant that is four feet tall in two months under one of these lights. Under the VHO lights, one may have to raise the lights every day which means a growth rate of at least two inches a day. The only drawback is the expense of the VHO lamps and fixtures. The VHO lamps and fixtures are almost twice the price of the standard. If you are interested in our opinion, they are well worth it. Now that you have your lights up, you might be curious about the amount of light to give your plants per day. The maturation date of your plants is dependent on how much light they receive per day. The longer the dark period per day, the sooner the plant will bloom. Generally speaking, the less darkness per day the better during the first six months of the plant's life. The older the plant is before it blooms and goes to seed, the better the grass will be. After the plant is allowed to bloom, its metabolic rate is slowed so that the plant's quality does not increase with the age at the same rate it did before it bloomed. The idea, then, is to let the plant get as old as possible before allowing it to mature so that the potency will be as high as possible at the time of harvest. One relatively sure way to keep your plants from blooming until you are ready for them is to leave the lights on all the time. Occasionally a plant will go ahead and bloom anyway, but it is the exception rather than the rule. If your plants receive 12 hours of light per day they will probably mature in 2 to 2.5 months. If they get 16 hours of light per day they will probably be blooming in 3.5 to 4 months. With 18 hours of light per day, they will flower in 4.5 to 5 months. It's a good idea to put your lights on a timer to ensure that the amount of light received each day remains constant. A "vacation" timer, normally used to make it look like you are home while you are away, works nicely and can be found at most hardware or discount stores.

Energy Emissions In Arbitrary Color Bands

Beginner's Guide to Growing Marijuana

40 Watt Flourescent Lamps

In Watts and Percent of Total Emissions

Daylight Cool White Gro-Lux GroLux WS

Light Type Band Watts % Watt % Watt % Watt %

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Ultra-Violet -380 0.186 2.15 0.16 1.68 0.10 1.42 0.27 3.16  
Violet 380-430 0.832 9.60 0.72 7.57 0.70 9.67 1.07 12.48  
Blue 430-490 2.418 27.91 1.98 20.78 1.96 27.07 1.22 14.29  
Green 490-560 2.372 27.38 2.35 24.67 1.02 14.02 1.24 14.49  
Yellow 560-590 1.259 14.53 1.74 18.27 0.10 1.42 0.83 9.77  
Orange 590-630 1.144 13.21 1.69 17.75 0.44 6.05 1.36 15.93  
Red 630-700 0.452 6.22 0.81 8.47 2.86 39.55 1.86 21.78  
Far Red 700-780 0.130 1.53 0.07 0.81 0.06 0.80 0.69 8.10  
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Total 8.890 100.0 9.52 100.0 7.24 100.0 8.54 100.0

Temperature and Humidity

The ideal temperature for the light hours is 68 to 78 degrees fahrenheit and for the dark hours there should be about a 15 degree drop in temperature. The growing room should be relatively dry if possible. What you want is a resinous coating on the leaves and to get the plant to do this, you must convince it that it needs the resinous coating on its leaves to protect itself from drying out. In an extremely humid room, the plants develop wide leaves and do not produce as much resin. You must take care not to let the temperature in a dry room become too hot, however, since the plant cannot assimilate water fast enough through its roots and its foliage will begin to brown out.

Ventilation

Proper ventilation in your growing room is fairly important. The more plants you have in one room, the more important good ventilation becomes. Plants breathe through their leaves. They also rid themselves of poisons through their leaves. If proper ventilation is not maintained, the pores of the leaves will become clogged and the leaves will die. If there is a free movement of air, the poisons can evaporate off the leaves and the plant can breathe and remain healthy.

In a small closet where there are only a few plants you can probably create enough air circulation just by opening the door to look at them. Although it is possible to grow healthy looking plants in poorly ventilated rooms, they would be larger and healthier if they had a fresh supply of air coming in. If you spend a lot of time in your growing room, your plants will grow better because they will be using the carbon dioxide that you are exhaling around them. It is sometimes quite difficult to get a fresh supply of air in to your growing room because your room is usually hidden away in a secret corner of your house, possibly in the attic or basement. In this case, a fan will create some movement of air. It will also stimulate your plants into growing a healthier and sturdier stalk. Often times in an indoor environment, the stems of plants fail to become rigid because they don't have to cope with elements of wind and rain. To a degree, though, this is an advantage because the plant puts most of its energy into producing leaves and resin instead of stems.

Dehumidifying Your Growing Room

Cannabis that grows in a hot, dry climate will have narrower leaves than cannabis grown in a humid atmosphere. The reason is that in a dry atmosphere the plant can respire easier because the moisture on the leaves evaporates faster. In a humid atmosphere, the moisture cannot evaporate as fast. Consequently, the leaves have to be broader with more surface area in order to expel the wastes that the plant put out. Since the broad leaves produce less resin per leaf than the narrow there will be more resin in an ounce of narrow leaves than in one ounce of broad leaves. There may be more leaf mass in the broader leafed plants, but most people are growing their own for quality rather than quantity.

Since the resin in the marijuana plant serves the purpose of keeping the leaves from drying out, there is more apt to be a lot of resin produced in a dry room than in a humid one. In the Sears catalog, dehumidifiers cost around \$100.00 and are therefore a bit impractical for the "hobby grower."

Beginner's Guide to Growing Marijuana

Watering

If you live near a clear mountain stream, you can skip this bit on the quality of water. Most of us are supplied water by the city and some cities add more chemicals to the water than others. They all add chlorine, however, in varying quantities. Humans over the years have learned to either get rid of it somehow or to live with it, but your marijuana plants won't have time to acquire a taste for it so you had better see that they don't have to. Chlorine will evaporate if you let the water stand for 24 hours in an open container. Letting the water stand for a day or two will serve a dual purpose: The water will come to room temperature during that period of time and you can avoid the nasty shock your plants suffer when you drench them with cold water. Always water using room temperature or lukewarm water. If your water has an excessive amount of chlorine in it, you may want to get some anti-chlorine drops at the local fish or pet store. The most important thing about watering is to do it thoroughly. You can water a plant in a three gallon container with as much as three quarts of water. The idea is to get the soil evenly moist all the way to the bottom of the pot. If you use a little water, even if you do it often, it seeps just a short way down into the soil and any roots below the moist soil will start to turn upwards toward the water. The second most important thing about watering is to see to it that the pot has good drainage. There should be some holes in the bottom so that any excess water will run out. If the pot won't drain, the excess water will accumulate in a pocket and rot the roots of the plant or simply make the soil sour or mildew. The soil, as we said earlier, must allow the water to drain evenly through it and must not become hard or packed. If you have made sure that the soil contains sand and perlite, you shouldn't have drainage problems. To discover when to water, feel the soil with your finger. If you feel moisture in the soil, you can wait a day or two to water. The soil near the top of the pot is always drier than the soil further down. You can drown your plant just as easily as you can let it get too dry and it is more likely to survive a dry spell than it is to survive a torrential flood. Water the plants well when you water and don't water them at all when they don't need it.

Bugs

If you can avoid getting bugs in the first place you will be much better off. Once your plants become infested you will probably be fighting bugs for the rest of your plants' lives. To avoid bugs be sure to use sterilized soil and containers and don't bring other plants from outside into your growing room. If you have pets, ensure that they stay out of your growing room, since they can bring in pests on their fur. Examine your plants regularly for signs of insects, spots, holes in the leaves, browning of the tips of the leaves, and droopy branches. If you find that somehow in spite of all your precautions you have a plant room full of bugs, you'll have to spray your plants with some kind of insecticide. You'll want to use something that will kill the bugs and not you. Spider mites are probably the bug that will do the most damage to the marijuana plants. One of the reasons is that they are almost microscopic and very hard to spot. They are called spider mites because they leave a web-like substance clinging to the leaves. They also cause tiny little spots to appear on the leaves. Probably the first thing you'll notice, however, is that your plants look sick and depressed. The mites suck enzymes from the leaves and as a result the leaves lose some of their green color and glossiness. Sometimes the leaves look like they have some kind of fungus on them. The eggs are very tiny black dots. You might be wise to get a magnifying glass so that you can really scrutinize your plants closely. Be sure to examine the underside of the leaves too. The mites will often be found clinging to the underside as well as the top of the leaves. The sooner you start fighting the bugs, the easier it will be to get rid of them. For killing spider mites on marijuana, one of the best insecticides is "Fruit and Berry" spray. Ortho also produces several insecticides that will kill mites. The ingredients to look for are Kelthane and Malathion. Both of these poisons are lethal to humans and pets as well as bugs, but they both detoxify in about ten days so you can safely smoke the grass ten days after spraying. Fruit and Berry will only kill the adult mite, however, and you'll have to spray every four days for about two weeks to be sure that you have killed all the adults before they have had a chance to lay eggs. Keep a close watch on your plants because it only takes one egg laying adult to re-infest your plants and chances are that one or two will escape your barrage of insecticides. If you see little bugs flying around your plants, they are probably white flies. The adults are immune to almost all the commercial insecticides except Fruit and Berry which will not kill the eggs or larva. It is the larval stage of this insect that does the most damage. They suck out enzymes too, and kill your plants if they go unchecked. You will have to get on a spraying program just as was explained in the spider mite section.

An organic method of bug control is using soap suds. Put Ivory flakes in some lukewarm water and work up the suds into a lather. Then put the suds over the plant. The obvious disadvantage is if you don't rinse the soap off the plant you'll taste the soap when you smoke the leaves.

Beginner's Guide to Growing Marijuana

Pruning

We have found that pruning is not always necessary. The reason one does it in the first place is to encourage secondary growth and to allow light to reach the immature leaves. Some strands of grass just naturally grow thick and bushy and if they are not clipped the sap moves in an uninterrupted flow right to the top of the plant where it produces flowers that are thick with resin. On the other hand, if your plants appear tall and spindly for their age at three weeks, they probably require a little trimming to ensure a nice full leafy plant. At three weeks of age your plant should have at least two sets of branches or four leaf clusters and a top. To prune the plant, simply slice the top off just about the place where two branches oppose each other. Use a razor blade in a straight cut. If you want to, you can root the top in some water and when the roots appear, plant the top in moist soil and it should grow into another plant. If you are going to root the top you should cut the end again, this time with a diagonal cut so as to expose more surface to the water or rooting solution. The advantage to taking cuttings from your plant is that it produces more tops. The tops have the resin, and that's the name of the game. Every time you cut off a top, the plant sends out two more top branches at the base of the existing branches. Pruning also encourages the branches underneath to grow faster than they normally would without the top having been cut.

Harvesting and Curing

Well, now that you've grown your marijuana, you will want to cure it right so that it smokes clean and won't bite. You can avoid that "homegrown" taste of chlorophyll that sometimes makes one's fillings taste like they might be dissolving. We know of several methods of curing the marijuana so that it will have a mild flavor and a mellow rather than harsh smoke.

First, pull the plant up roots and all and hang it upside down for 24 hours. Then put each plant in a paper grocery bag with the top open for three or four days or until the leaves feel dry to the touch. Now strip the leaves off the stem and put them in a glass jar with a lid. Don't pack the leaves in tightly, you want air to reach all the leaves. The main danger in the curing process is mold. If the leaves are too damp when you put them into the jar, they will mold and since the mold will destroy the resins, mold will ruin your marijuana. You should check the jars every day by smelling them and if you smell an acrid aroma, take the weed out of the jar and spread it out on newspaper so that it can dry quickly. Another method is to uproot the plants and hang them upside down. You get some burlap bags damp and slip them up over the plants. Keep the bags damp and leave them in the sun for at least a week. Now put the plants in a paper bag for a few days until the weed is dry enough to smoke. Like many fine things in life, marijuana mellows out with age. The aging process tends to remove the chlorophyll taste.

Editor's Note and Important Warning:

The information age is upon us, and increasing amount of data is being kept about all of us whether we realize it or not. With the war on drugs in full effect, the D.E.A. is using this information at every possible opportunity. When you make a purchase with a credit card, every last bit of information regarding that purchase is filed away into a database, both at the store and with your credit card company. Not only the price, but the exact date, location, and items purchased are recorded and stored away. Many stores and credit card companies routinely sell their databases of customers and transactions to anybody who can afford it. The D.E.A. can certainly afford it. After all, they're using your tax dollars. The D.E.A. as well as other government agencies DO purchase these databases for their own uses. They feed them into their computers and the computers spit out a list of anybody with "suspicious" purchases. Any purchases that could be associated with drug production, use, or selling could be flagged for further investigation. These "suspicious" purchases include unusual chemicals, medical supplies such as syringes, lights and timers, and even potting soil and fertilizer. The point is, if you are planning on purchasing supplies to grow marijuana don't take any chances. While the average home grower, who is simply growing enough for his own use, would probably never be flagged by the computers, you never know. If you are purchasing equipment or supplies, PAY CASH! In addition, many supermarkets and discount stores now have some sort of "Preferred Customer" cards. When you buy something, regardless of how you pay, you give them your card to scan and all your purchases are recorded. They then send you some sort of coupon depending on what and how much you purchased each month. It sounds like a good deal, but you wind up having all of your purchases recorded and sold just like with the credit cards. DON'T use one of these cards when you are purchasing anything that might be deemed suspicious. For that matter, don't use them at all. They just result in a ton of junk mail and a lot of people knowing exactly what you buy and when you buy it.

THE ULTIMATE GUIDE TO GROWING MARIJUANA

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OVERVIEW

There are few things in life as good as your own herb, grown by yourself at home out in the garden and indoors in pots... Oregano, Dill, Basil, Sage and other herbs are all easy to grow. Mint will take over the whole yard if you let it. Fresh mint and cilantro are incredible in salads and oriental dishes. But it all comes down to a truly motivational herb that is your friend and mine, a great healer and teacher to those that know it well.

Most people think of gardens as a seasonal, yearly project, but it's actually less time consuming and more rewarding to keep the garden going year round. If one were to attempt to grow year round, indoor gardening techniques will be needed at least during winter to keep the garden producing. You will have herb fresh at all times, there is no worry of mass storage through the winter and spring, it requires less space, and once established, requires only minimal attention every week to keep it producing at optimal levels.

The best part of being a gardener is it connects you to the earth. It connects you with nature, and is spiritually enriching. Try giving your plants energy by beaming good thoughts and energy at them every time you visit them. I find this helps me as much as it helps them; my plants seem to respond to it favorably.

GENETICS AND THE PLANT

It's very important to start with good genetics. You should attempt to find seeds from local gardeners that are acclimated and bred for local climate and best floral characteristics. Potency, aroma, fast growth, early maturation, resistance to fungus and pests. All of these factors are considered by the seasoned gardener and you will benefit enormously by finding a friend to get you started on the journey that never ends...

Attempt to find an Indica/Sativa hybrid if possible, as this will have the best high and good characteristics for indoor growth as well. Indica plants have a heavy, stony high that is tiresome, and sativas' are hard to grow indoors due to high light requirements, and late flowering traits, so a hybrid can be bred that will have the energetic, cerebral high of the sativa and the early maturation tendencies of the Indica plant.

The Indica plant is easily recognized by its extremely broad leaves that are very rounded on the sides. The Sativa has very narrow, finger-like leaves. A hybrid will have qualities of both and have leaves that are a cross of these two types, thinner than an Indica, but much broader than a Sativa. It is possible to recognize a good hybrid by the leaves once you know what to look for.

Look for seeds that are dark brown or light grey. Some may have dark lines inset into these colors, like tiger stripes. White, small seeds are immature and should not be planted.

INDOORS & OUTDOORS - CONSTANT HARVEST STRATEGY

One of the best solutions to energy verses output for most home gardeners is to use outdoor light for flowering and use continuous light indoors for germination and vegetative growth. This will take advantage of the natural light/dark cycle and cut your energy use in half compared to the same operation indoors. A small greenhouse can be built of Filon fiberglass or PVC sheets that is innocuous and looks much like a storage shed or tool shed so it's not likely to raise suspicions.

In fact, a large shed of metal or plywood can be modified with a luminous roof of PVC, glass, fiberglass or plastic sheet, and some strains that do not require a great deal of light will grow well. Such a shed will discourage fly-by sightings and keep your business your own! It also allows you to keep out rats and gophers, keeps out the neighbor kids, and can be easily locked up. It will also give you an opportunity to actually plant in the ground if you desire, and this is the best way to avoid root-bound plants (if your not using hydroponics), and get bigger harvests.

In winter, indoor space is used to start new seedlings or cuttings to be placed outside in the spring, using natural sunlight to ripen the plants. This routine will provide at least 3 outdoor/greenhouse harvests per year. If more space is available to constantly be starting

indoors and flowering 2nd harvest plants outdoors, harvests are possible every 60 days in many areas, with a small indoor harvest in the winter as a possibility as well.

The basic strategy of year round production is to understand the plant has two growth cycles. At germination the plant enters into a vegetative state and will be able to use all the continuous light you can give it. This means there is no dark cycle required. The plant will photosynthesis constantly and grow faster than it would outdoors with long evenings. Photosynthesis stops during dark periods and the plant uses sugars produced to build during the evening. This is not a requirement and the plant will grow faster at this stage with continuous photosynthesis (constant light).

Once the plant is 12-18" tall, weather permitting, it can be forced to start flowering by placing it outside in the Spring or Fall. (For Summer outdoor flowering, the night must be artificially lengthened in the greenhouse to "force" the plants to flower. See FLOWERING chapter.)

Moving the plants to 10-13 hour light periods (moving it outside) with uninterrupted darkness (no bright lights nearby) will force the plant to flower. It will ripen and be 2-3' when ready to harvest. When a plant is moved from continuous indoor light to a 10-13 hour day outside, it will start to flower in anticipation of oncoming winter. Vegetative starts moved outside March 1st, will be ripe by May 1. Vegetative starts moved outside on May 1 will be ripe by July 1. Starts moved outside Sept 1 are picked by Nov. 1st. In Winter, operations are moved indoors and a crop is planted for seed in anticipation of planting outdoors the next summer, or just for some extra winter stash.

Keep in mind that the "man" is looking for plants in the Sept./Oct./Nov. time-frame, and may never notice plants placed outside to flower in April. Be smart, make your big harvest in May, not October!

PLANTING INDOORS

A small indoor space should be found that can be used to germinate seeds; these vegetative starts are placed outside to mature in the spring after last freezes are over. The space can be a closet, a section of a bedroom, a basement area, an attic or unused bathroom. Some people devote entire bedrooms to growing.

The space must be light leak proofed, so that no suspicious light is seen from outside the house. This could invite fuzz or rip-offs.

The space should be vented. Opening the door of a closet can be enough ventilation if the space is not lit by big lights that generate a lot of heat. Separate exhaust and incoming air vents are best. One at the top of the room to exhaust air into the attic or out the roof, and one to bring in air from an outside wall or under-floor crawl space. Use fans from old computer cabinets, available from electronic liquidators for \$5 each. Dimmer switches can be used to regulate the speed/noise of the fans. Use silicon to secure the fans to 4-6" PVC pipe pushed through a round hole cut in the floor and ceilings. Use lots of silicon to damp the fans vibrations, so that the walls do not resonate to the fans' oscillations.

Line the walls with aluminum foil, dull side out to diffuse the light and prevent hot-spots, or paint the walls bright white to reflect light. Aluminized mylar, 1 mil thick is best. (\$20 for 25 feet of a 4' wide roll.) Mirrors are not good to use, since the glass eats light!

Line the floor with plastic in case of water spills, etc. Set up a voltage interrupt socket and be sure the electrical wiring will handle the lamps your going to use. Always place ballast's for HID lamps on a shelf, so they are above floor level, in case of water spills. Spacers place on the floor under a ballast will work too.

A shelf above the main grow area can be used to clone cuttings and germinate seedlings. It will allow you to double the area of your grow space and is an invaluable storage area for plant food, spray bottles and other gardening supplies. This area stays very warm, and no germination warming pad will be needed, so this arrangement saves you \$.

Hang a light proof curtain to separate this shelf from the main area when used for flowering.

This will allow constant lights on the shelf and dark periods in the main grow area. Velcro can be used to keep the curtain in place and ties can be used to roll it up when tending the garden.

Black vinyl with white backing works best.

Now you need light. A couple of shop lights will be fine if you just want to start plants inside and then take them outside to grow in a small greenhouse. They can be purchased with bulbs for about \$10 each, or without bulbs for around \$8. Try to find them on sale. Use one Cool White and one Warm Light type bulb in each to get the best light spectrum possible for plant growth. Do not use expensive Grow Lux type bulbs, as they do not put out as much light, and therefore do not work as well in most situations (go figure). If Cool White is all you can find, or afford, use them. They work fine, and are by far the cheapest.(About \$1-2 each.)

SHELF GROWING

Shelf gardening with fluorescents may be the trend of the future, since the materials are so inexpensive, and easy to obtain. Fluorescent lamps are great for shelf gardening. In this system, many shelves can be placed, one above the other, and fluorescent lamps are used on each shelf. Some shelves have 24 hour lighting, some have 12 hour lighting (for flowering). Two areas are best, perhaps with one other devoted to cloning and germination of seed. Shelf gardening assumes your going to keep all plants 3' or shorter at maturity, so all shelves are 3-4 feet apart. Less light is necessary when you have plants that are this short and forced to mature early.

One drawback to a shelf garden like this is that it is very time consuming to adjust the lamp height every day, and it is harder to take a vacation for even a week with no tending of the garden. This applies mostly to the vegetative stage, when plants are growing as much as an inch per day. Lamps on the flowering shelves are not adjusted nearly as often.

Normally, the lamps should be kept within 2 inches of the tops of the plants, with the plants arranged such that they get progressively taller as the end of the lamps go up, so that all plants are within this 2" range. This is an ideal however, and if you do go on vacation, adjust the lamps so that your sure the plants will not be able to grow up to the lamps within that length of time. If enough flourecents are used to completely saturate the shelf with light, the spacing issue will not create spindly plants. They will nearly grow a little slower if the lamps are not very close to them.

An alternative is to use fluorescent lamps for cloning, germination and early seedling growth on the top shelf of a closet, then switch over to HPS for heavy vegetative growth and/or flowering in the main closet area.

Position the HPS such that it won't need adjustment, at the top most possible point in the closet or room. Most HPS installations will not require lamp height adjustment. Just attach the lamp to the underside of shelf or ceiling as high as possible, and if you want to get a few plants closer to it, put them on a temporary shelf, box or table to get them closer to the lamp. A shelf is all that is necessary with this type of setup, preferably at least 18" wide, up to about 24" maximum. This area must be painted a very bright white, or covered with aluminum foil, dull side out to reflect light back to the plants. (Dull side out prevents hot-spots; diffuses light better.) Paint the shelf white too. Or, use aluminized mylar, a space blanket, or any silvery surface material. Do not use mirrors, as the glass soaks up light.

Hang shop lamps from chains and make sure you can adjust them with hooks or some other type of mechanism so they can be kept as close to the plants as possible at all times (1-2"). If the lamps are too far from the plants, the plants could grow long, spindly stems trying to reach the lamp, and will not produce as much bud at maturity. This is due to internode length being much longer. This is the length of stem between each set of leaves. If it is shorter, there can be more internodes, thus more branches, thus a plant that provides more buds in less space at harvest time.

Shelf gardening is sometimes referred to as Sea of Green, because many plants are grown close together, creating a green canopy of tops that are grown and matured quickly, and the next crop is started and growing concurrently in a separate area of continuous light. Clones are raised in a constant light shelf, until they start to grow well vegetatively, then placed on a 12 hour per day shelf to flower.

LIGHT

Indoors, 2000 lumens per sq. ft. is about as low as you want to go indoors. If you get under this mark, plant growth will certainly not go as fast as possible, and internode/stem length will increase. Also, light distance to plants will be much more critical. Daily adjustments to the lamps will be necessary, meaning you get no vacations.

2500 lumens psf should be a good target, and 3000 is optimal if your going to inject or enrich CO2 levels (more on that later).

High Intensity Discharge lamps are the best solution for most indoor growers. HID lamps come in 3 basic flavors: High Pressure Sodium (HPS), Metal Halide (MH) and Mercury Vapor. Metal Halide is an improved spectrum, higher intensity Mercury Vapor design. HPS is a yellowish sort of light, maybe a bit pink or orange. Same as some street lamps.

HPS lamps can be used to grow a crop from start to finish. Tests show that the HPS crop will mature 1 week later than a similar crop under MH, but it will be a bigger yield, so it's better to wait the extra week.

The easiest HID to buy, and least expensive initially are the fluorescent and mercury vapor lamps. MV will put out about 8000 lumens per 175 watts, and 150 watts of HPS puts out about 15k lumens, so HPS is almost twice as efficient. But the color spectrum from MV lamp output is not as good. HPS is high in reds, which works well for flowering, while the Metal Halide is rich in blues, needed for the best vegetative growth. Unfortunately, MV lamps provide the worst spectrum for plant growth, but are very inexpensive to purchase. They are not recommended, unless you find them free, and even then, the electricity/efficiency issues outweigh the initial costs saved.

400 watt HPS will output around 45k lumens. For every 500 watts of continuous use, you use about \$20 a month in electricity, so it is evident that a lamp taking half the power to output the same lumens (or twice the lumens at the same power level) will pay for itself in a year or so, and from then on, continuous savings will be reaped. This is a simple initial cost vs. operating costs calculation, and does not take into account the faster growth and increased yield the HPS lamp will give you, due to more light being available. If this is factored into the calculation the HPS lamp will pay for itself with the first crop, when compared to MV or fluorescent lamps, since it is easily twice as efficient and grows flowers faster and bigger.

Lamp Type	Watts	Lumens per bulb	Total efficiency
Fluorescent Bulb	40	3000	400 watts = 30k lumens
Mercury Vapor	175	8000	400 watts = 20k lumens
Metal Halide	400	36000	400 watts = 36k lumens
High P. Sodium	400	45000	400 watts = 45k lumens

Notice the Mercury Vapor lamps are less efficient than the fluorescent (FL), and can not be positioned as close to the plants, so the plants will not be able to use as much of the MV light. The light distribution is not as good either. MV lamps simply are not suitable for indoor gardening. Use fluorescent, MH, or HPS lamps only. Halogen arc lamps generate too much heat and not very much light for the wattage they use, and are also not recommend, even though the light spectrum is suitable for decent growth.

There is a new type of HPS lamp called Son Agro, and it is available in a 250, 1000, and 400 watt range. The 400 is actually 430 watts; they have added 30 watts of blue to this bulb. It is a very bright lamp (53k lumens) and is made for greenhouse use. These bulbs can be purchased to replace normal HPS bulbs, so they are an option if you already own a HPS lamp. The beauty of this bulb is that you do not give up most of the advantages of MH lamps, such as minimal internode spacing and early maturation, like most HPS users do, and you have all advantages of a HPS lamp. One bulb does it all.

Internodal length of plants grown with the Son Agro are the shortest ever seen with any type of lamp. Plants grown under this lamp are incredibly bushy, compact and grow very fast. Son

Agro bulbs however, do not last as long as normal HPS bulbs. There is something like a 25% difference in bulb life.

Metal Halide (MH) is another option, and is available in both a 36k and 40k lumen bulbs for the 400 watt size. The Super Bulb (40k) is about \$10-15 more, and provides an extra 4000 lumens. I think the Super Bulb may last longer; if so, that makes it the way to go. Halide light is more blue and better than straight HPS for vegetative growth, but is much less efficient than HPS. It is possible to purchase conversion bulbs for a MH lamp that convert it to HPS, but the cost of the conversion bulb is more expensive than the color corrected Son Agro bulb, so I would recommend just buying the Son Agro HPS. Even though it costs more initially, you get more for your energy dollar later, and it's much easier to hang than 10 fluorescent tubes.

If you have a MH 36k lumen lamp burning at 400 watts and a 53k lumen HPS burning at 430 watts, which is better efficiency wise? Which will provide a better yield? Obviously, the Son Agro HPS, but of course, the initial cost is higher. Actually, the ballast will add about 10% to these wattage numbers.

The Son Agro bulb will prove much better than the MH for any purpose. The MH bulb does not last as long, but is cheaper. Compare \$36 for a 400 watt MH bulb vs. \$40 for the HPS bulb. Add \$15 for the Son Agro HPS. The HPS bulb life is twice as long. 10k hours vs. 21k hours. The Son Agro is 16k hours or so. Still, longer bulb life and more light add up to more for your energy dollar long term.

Horizontal mounting of any HID is a good idea, as this will boost by 30% the amount of light that actually reaches the plants. Most HID's sold for indoor garden use these days are of this horizontal mounting arrangement.

HPS is much less expensive to operate than any other type of lamp, but comes in the 70 watt size at the home improvement stores. This size is not very efficient, but blows away FL in efficiency, so they might be an alternative to FL for very small operations, like 9 sq. feet or less. Over 9 sq. feet, you need more light than one of these lamps can provide, but you could use two of them. 70 watt HPS lamps cost about \$40 each, complete. Two lamps would be 140 watts putting out about 12k lumens, so it's better than FL, but a 150 watt HPS puts out about 18k lumens, the bulb life is longer, bulbs are cheaper and the lamp more efficient to operate. The biggest problem is that the mid size lamps like the 150 and 250 watt HPS are almost as expensive to buy as the larger 400's. For this reason, if you have room for the larger lamp, buy the 400. If your going pro, a 1080 watt model is available too, but you might find there is better light distribution from two 400's rather than one large lamp. Of course, the two smaller lamps are more expensive to purchase than one large lamp, so most people choose the larger lamp for bigger operations.

Heat buildup in the room is a factor with HID lamps, and just how much light the plants can use is determined by temperature, CO2 levels, nutrient availability, pH, and other factors. Too big of a lamp for a space will make constant venting necessary, and then there is no way to enrich CO2, since it's getting blown out of the room right away.

Bulb Costs: the bulb cost on the 70 watt HPS is \$24, the 150 is only \$30, and the 400 is only \$40. So you will spend more to replace two 70 watt bulbs than you will to replace one 400 watt HPS. (Go figure.) Add that up with the lower resale value on the 70's (practically nothing) and the fact that they are being modified and are not suited to this application, and it becomes evident that \$189 for a 250 HPS lamp, or \$219 for a 400, might just be worth the price. Keep in mind that for \$30 more, you can have the larger lamp (400watt) and it puts out 20k lumens more light than the smaller lamp. Not a bad deal!

Here is the breakdown on prices (from memory):

Type	Complete Cost	Bulb Cost	Bulb Life Lumens	
HPS 400	\$219	\$40	18k hours	50k
MH 400	\$175	\$37	10k hours	36k
Son Agro400	\$235	\$55	15k hours	53k
Super MH400	\$190	\$45	??	40k
MH 250	\$149	\$32	??	21k
HPS 250	\$165	\$36	??	27k
HPS agro250	\$180	\$53	??	30k
MH 150	\$139	\$25	??	14k
HPS 175	\$150	\$30	??	17k

If your looking for these types of lamps, look in the Yellow Pages under gardening, nurseries, and lighting for indoor gardening stores in your area.

SEA OF GREEN

Sea of Green (SOG) is the theory of harvesting lots of small plants, matured early to get the fastest production of buds available. Instead of growing a few plants for a longer period of time, in the same space many smaller plants are grown that mature faster and in less time. Thus, less time is required between crops. This is important to you when the electricity bill comes each month. One crop can be started while another is maturing, and a continuous harvest, year round can be maintained. 4 plants per square foot will be a good start for seedlings. 1 plant per square foot will allow plenty of room for each plant to grow a large top cola, but will not allow for much bottom branching. This is OK since indoors, these bottom branches are always shaded anyway, and will not grow very well unless given additional light and space. The indoor grower quickly realizes that plants that are too tall do not produce enough at the bottom to make the extra growing time used worth while. An exception to this rule would be if it is intended the plants are to go outside at some point, and it is expected that the light/shading issue will not be a factor at that point.

The plants, if started at the same time, should create what is called a "green canopy" that traps most of the light at the top level of the plants. Little light will penetrate below this level, since the plants are so close together. The gardener is attempting to concentrate on the top of the plant, and use the light and space to the best advantage, in as little time as possible. Use of nylon poultry fence or similar trellising laid out over the green canopy will support the plants as they start to droop under the weight of heavy fruiting tops. Stakes can be used too, but are not as easy to install for plants in the middle and back of the room, where reach is more difficult.

It's easy to want big plants, since they will produce more yield per plant, but it's usually better with limited space to grow smaller plants that mature faster and pack into smaller spaces. Sea of Green was developed in Holland. Instead of fitting 4 large plants in that small room, fit 12 small ones on a shelf above 12 other small plants. These plants take only 3-4 months to mature from germination to ripe buds, and harvesting takes place constantly, since there is both a vegetative and flowering area devoted to each, with harvests every 45-60 days.

It's not the size of the plant, but the maturity and quality of the product that counts. Twice as many plants grown half as big will fill the grow space twice as fast, so harvests take place almost twice as often. Get good at picking early flowering plants, and propagate only those that are of the best quality.

6" square containers will allow for 4 plants per square foot. You may also gauge by the size of your growing tray (for passive hydroponics); I like kitty litter boxes. (\$3 each at Target) Planted 4 per square foot, (for vegetative seedlings) a 12 sq. ft. closet will hold 48 seedlings on one shelf. In my case, I use 4" rockwool cubes that fit into kitty litter pans @ 12 cubes per pan. I can get 5 pans onto a 12 sq. ft. closet upper shelf, so that is 60 seedlings on one small shelf!

For flowering indoors, 1 plant per sq. ft. is a good rule of thumb for SOG. If less plants are grown in this size space, it will take them longer to fill the space, thus more electricity and time will be used to create the same amount of product. If more than one plant p.s.f. is attempted, the grower will soon find that plants thus crowded tend to be more stem than bud, and the total harvest may be reduced, so be cautious.

It's good to avoid "topping" your plants if you want them to grow as fast as possible. It's better just to grow 2 or 4 times more plants, since they will produce more, faster, in the same space. Also, "training" plants with twist-ties is a great way to get them to bush out a bit. Just take any type of plastic or paper twist tie and wrap it around the top of the plant, then pull it over until the top is bent over 90-180 degrees and then attach this to the main stem lower on the plant. Do this for one week and then release the plant from it's bond. The plant can be trained in this fashion to take less vertical space and to grow bushier, to fill the grow space and force lower limbs to grow upward and join the green canopy. This technique takes advantage of the fact that if the top is pulled over, it creates a hormonal condition in the plant that makes it bush out at all lower internodes.

Sea of Green entails growing to harvest the main cola (top) of the plant. Bottom branches are trimmed to increase air flow under the "blanket" of growing tops. Use these cuttings for clones, as they are the easiest part of the plant to root. It's also the fastest part of the plant to regenerate after flowering has occurred.

GERMINATION

Germinate seeds in sterile soil (for planting outdoors) or a hydroponic medium of rockwool or vermiculite. DO NOT (!) use a Jiffy cube #7 to germinate seeds. Informal tests and experience show these peat cubes do not work well and stunt the plants growth. Planting in vermiculite gives the seedling so much oxygen, and are so easy for roots to grow in, that the plants look large 1 week after germination!

Keep them moist at all times, by placing seeds in vermiculite filled 16oz cups with holes in the bottom, placed in a tray of weak nutrient solution, high in P. Rockwool cubes also work extremely well. When the seed sprouts, place the rockwool cubes into larger rockwool cubes. No repotting or transplanting, and no soil mixing!

You can germinate seeds in a paper towel. This method is tricky; it's easy to ruin roots if they dry out, or are planted too late after germinating. Paper towels dry out REAL FAST! Place paper towel in a bowl, saturated with weak nutrient solution (not too much!), and cover with plastic wrap to keep it from drying out. Put bowl in a warm area; top of the gas stove, water heater closet, or above warm lamps. Cover with black paper to keep out light. Check every 12 hours and plant germinated seeds with the grow tip up (if possible) in a growing medium as soon as the root coming out of the seed is 1/16" or longer. Use tweezers, and don't touch the root tip.

Transplant as little as possible by germinating in the same container you intend to grow the plant in for a significant period of time. Just plant in vermiculite or rockwool. You will be amazed at the results! 90% germination is common with this method, as compared to 50% or less with Jiffy Cubes. (Your mileage may vary.)

5-55-17 plant food such as Peter's Professional will stimulate root growth of the germinating seed and the new seedlings. Use a very dilute solution, in distilled water, about 1/3 normal strength, and keep temperatures between 72-80 degrees. Warm temperatures are very important. Many growers experience low germination rate if the temperatures are out of this range. A heating pad set to low or medium may be necessary, or a shelf constantly warmed by a light may do, but test it with a few seeds first, before devoting next years crop to it. No light is necessary and may slow germination. Cover germinating seeds with black paper to keep out light. Place seedlings in the light once they sprout.

Plan on transplanting only once or twice before harvest. Use the biggest containers possible for the space and number of seedlings you plan to start. Plants will suffer if continuously transplanted and delay harvesting. You will suffer too, from too much work! 13 2-liter plastic soda bottles filled with vermiculite/pearlite will fit in a cat box tray, and will not require

transplanting for the first harvest, if you intend to grow hydroponically. Transplant them for a second regenerated harvest.

Cut holes in the bottom of containers and fill the last few inches at the top with vermiculite only, to start seeds or accept seedling transplants. Since vermiculite holds water well, wicks water well, but does not hold too much water, roots always have lots of oxygen, even if they are sitting in a tray full of water. A hydrogen peroxide based plant food is used to get extra oxygen to the plants when the pans are kept continuously full. The water can be allowed to recede each time after watering, before new solution is added. This allows the plants roots to dry somewhat, and make sure they are getting enough oxygen.

Use SuperSoil brand potting soil, as it is excellent and sterilized. If you insist on using dirt from the yard, sterilize it in the microwave or oven until it gets steamy.(NOT RECOMMENDED) Sterilize the containers with a bleach solution, especially if they have been used a previous season for another plant.

VEGETATIVE GROWTH

Once sprouted, the plant starts vegetative growth. This means the plant will be photosynthesizing as much as possible to grow tall and start many grow tips at each pair of leaves. A grow tip is the part that can be cloned or propagated asexually. They are located at the top of the plant, and every major internode. If you "top" the plant, it then has two grow tips at the top. If you top each of these, you will have 4 grow tips at the top of the plant. (Since it takes time for the plant to heal and recover from the trauma of being pruned, it faster to grow 4 smaller plants and not top them at all. Or grow 2 plants, and "train" them to fill the same space. Most growers find)

All plants have a vegetative stage where they are growing as fast as possible after the plant first germinates from seed. It is possible to grow plants with no dark period, and increase the speed at which they grow by 15-30%. Plants can be grown vegetatively indefinitely. It is up to the gardener to decide when to force the plant to flower. A plant can grow from 12" to 12' before being forced to flower, so there is a lot of latitude here for each gardener to manage the garden based on goals and space available.

A solution of 20-20-20 with trace minerals is used for both hydroponic and soil gardening when growing continuously under lights. Miracle Grow Patio or RapidGrow plant food is good for this. A high P plant food such as Peter's 5-50-17 food is used for blooming and fruiting plants when beginning 12 hour days. Epsom salts (1tsp) should be used in the solution for magnesium and sulfur minerals. Trace minerals are needed too, if your food does not include them. Miracle Grow Patio includes these trace elements, and is highly recommended. Keep lights on continuously for sprouts, since they require no darkness period like older plants. You will not need a timer unless you want to keep the lamps off during a certain time each day. Try to light the plants for 18 or more hours, or continuously at this point.

Bend a young plant's stem back and forth to force it to be very thick and strong. Spindly stems can not support heavy flowering growth. An internal oscillating fan will reduce humidity on the leave's stomata and improve the stem strength as well. The importance of internal air circulation can not be stressed enough. It will exerceize the plants and make them grow stronger, while reducing many hazards that could ruin your crop.

HYDROPONIC VEGETATIVE SOLUTION, per gallon:

Miracle Grow Patio (contains trace elements) 1 teaspoon

Epsom salts 1/2 teaspoon

Human Urine (OPTIONAL - may create odors indoors.) 1/4 cup

Oxygen Plus Plant Food (OPTIONAL) 1 teaspoon

This mixture will insure your plants are getting all major and minor nutrients in solution, and will also be treating your plants with oxygen for good root growth, and potassium nitrate for good burning qualities. Another good GROWTH PHASE mix is 1/4 tsp. Peter's 20/20/20 fertilizer per gallon of water, with trace elements and oxygen added, or fish emulsion. Fish emulsion is great in the green-house or outdoors, where smells are not an issue, but is not recommended for indoors, due to its strong odor.

FLOWERING

The the plant will be induced to fruit or flower with dark cycles of 11-13 hours that simulate the oncoming winter in the fall as the days grow shorter. As a consequence, it works out well indoors to have two separate areas; one that is used for the initial vegetative state and one that is used for flowering and fruiting. There is no other requirement other than to keep the dark cycle for flowering very dark with no light interruptions, as this can stall flowering by days or weeks.

Once a plant is big enough to mature (12" or over), dark periods are required for most plants to flower and bear fruit. This will require putting the lamp on a timer, to create regular and strict dark periods of uninterrupted light. In the greenhouse, the same effect can be created in the Summer (long days) by covering it with a blanket to make longer night periods. A strict schedule of covering the plants at 8pm and uncovering them at 8am for 2 weeks will start your plants to flowering. After the first 2 weeks, the schedule can be relaxed a little, but it will still be necessary to continue this routine for the plants to completely flower without reverting back to vegetative growth.

Outdoors, Spring and Fall, the nights are sufficiently long to induce flowering at all times. Merely bring the plants from indoors to the outside at these times, and the plants will flower naturally. In late Summer, with Fall approaching, it may be necessary only to force flowering the first two weeks, then the rapidly lengthening nights will do the rest.

Give flowering plants high P plant food and keep them on a strict light regimen of 12 hours, with no light, or no more than a full moon during the dark cycle. 13 hours light, 11 dark may increase flower size while still allowing the plant to go into the flowering mode. Use longer dark periods to speed maturity toward the end of the flowering cycle if speed is of the essence. (8-10 days) This will however, reduce total yield.

Two shelves can be used, one identical to the other, if strictly indoor gardening is desired. One shelf's lights are set for 12-13 hours, and one is lit continuously. Plants are started in continuous light, and are moved to the other shelf to flower to maturity after several weeks. This flowering shelf should be bigger than the "starting" or "vegetative" shelf, so that it can accommodate larger plants. Or, some plants can be taken outside if there is not enough space on the flowering shelf for all of them near harvesting.

A light tight curtain can be made from black vinyl, or other opaque material, with a reflective material on the other side to reflect light back to the plants. This curtain can be tied with cord when rolled up to work on the garden, and can be velcroed down in place to make sure no light leaks in or out. If the shelf is placed up high, it will not be very noticeable, and will fit in any room. Visitors will never notice it unless you point it out to them, since it is above eye level, and no light is being emitted from it.

Flowering plants like very high P level foods, such as 5-50-17, but 10-20-10 should be adequate. Nutrients should be provided with each watering when first flowering.

Trace elements are necessary too; try to find foods that include these, so you don't have to use a separate trace element food too. Home improvement centers sell trace element solutions rich in iron for lawn deficiencies, and these can be adapted for use in cultivating the herb. Prices for these mass produced fertilizers are significantly cheaper than the specialized hydroponic fertilizers sold in indoor gardening shops, and seem to work just fine.

HYDROPONIC FLOWERING SOLUTION, per gallon:

1 tsp. high P plant food, such as 15-30-15, or 5-50-17, etc.

1/2 tsp. epsom salts

1 tsp. Oxygen Plus Plant Food (Optional)

1 tsp. Trace Element food

I cannot stress enough that during the FLOWERING PHASE, the dark period should not be violated by normal light. It delays flower development due to hormones in the plant that react to light. If you must work on the plants during this time, allow only as much light as a VERY pale moon can provide for less than 5 minutes. Keep pruning to a minimum during the entire

FLOWERING PHASE.

A green light can be used to work on the garden during the dark period with no negative reactions from the plants. These are sold as nursery safety lights, but any green bulb should be OK. It is best to keep the dark hours a time when you would normally not wish to visit the garden. Personally, I like my garden lit from 7pm to 7am, since it allows me to visit the garden at night after work and in the morning before work, and all day long, while I'm too busy to worry about it, it lies unlit and undisturbed, flowering away...

Flowering plants should not be sprayed often as this will promote mold and rot. Keep humidity levels down indoors when flowering, as this is the most delicate time for the plants in this regard.

Early flowering is noticed 1-2 weeks after turning back the lights to 12 hour days. Look for 2 white hairs emerging from a small bulbous area at every internode. This is the easiest way to verify females early on. You can not tell a male from a female by height, or bushiness.

3-6 weeks after turning back the lights, your plants will be covered with these white pistils emerging from every growtip on the plant. It will literally be covered with them. These are the mature flowers, as they continue to grow and cover the plant. Some plants will do this indefinitely until the lights are turned back yet again. At the point you feel your ready to see the existing flowers become ripe (you feel the plant has enough flowers), turn the lights back to 8-10 hours. Now the plant will start to ripen quickly, and should be ready to harvest in 2-3 weeks. The alternative, is to allow the plant to ripen with whatever natural day length is available outside, or keep the plants on a constant 12 hour regimen for the entire flowering process, which may increase yield, but takes longer.

Plants can be flowered in the final stages outdoors, even if the days are too long for normal flowering to occur. Once the plant has almost reached peak floral development, it is too far gone to revert quickly to vegetative growth, and final flowering will occur regardless. This will free up precious indoor space sooner, for the next batch of clones to be flowered.

Look for the white hairs to turn red, orange or brown, and the false seed pods (you did pull the males, right?) to swell with resins. When most of the pistils have turned color (~80%), the flowers are ripe to harvest.

Don't touch those buds! Touch only the large fan leaves if you want to inspect the buds, as the THC will come off on your fingers and reduce the overall yield if mishandled.

HYDROPONICS

Most growers report that a hydroponic system will grow plants faster than a soil medium, given the same genetics and environmental conditions. This may be due to closer attention and more control of nutrients, and more access to oxygen. The plants can breath easier, and therefor, take less time to grow. One report has it that plants started in soil matured after hydroponic plants started 2 weeks later!

Fast growth allows for earlier maturation and shorter total growing time per crop. Also, with soil mixtures, plant growth tends to slow when the plants become root-bound. Hydroponics provides even, rapid growth with no pauses for transplant shock and eliminates the labor/materials of repotting if rockwool is used. (Highly recommended!)

By far the easiest hydroponic systems to use are the wick and reservoir systems. These are referred to as Passive Hydroponic methods, because they require no water distribution system on an active scale (pump, drain, flow meter and path). The basis of these systems is that water will wick to where you want it if the medium and conditions are correct.

The wick system is more involved than the reservoir system, since the wicks must be cut and placed in the pots, correct holes must be cut in the pots, and a spacer must be created to place the plants up above the water reservoir below. This can be as simple as two buckets, one fit inside the other, or a kiddie pool with bricks in it that the pots rest on, elevating them out of the nutrient solution.

I find the wick setup to be more work than the reservoir system. Initial setup is a pain with wicks, and the plants sit higher in the room, taking up precious vertical space. The base the

pot sits on may not be very stable compared to a reservoir system, and a knocked over plant will never be the same as an untouched plant, due to stress and shock in recovery.

The reservoir system needs only a good medium suited to the task, and a pan to sit a pot in. If rockwool slabs are used, a half slab of 12" rockwool fits perfectly into a kitty litter pan. The roots spread out in very desirable horizontal fashion and have a lot of room to grow. Plants grown in this manner are very robust because they get a great deal of oxygen at the roots. Plants grown with reservoir hydroponics grow at about the same rate as wicks or other active hydroponic methods, with much less effort required, since it is by far the simplest of hydroponic methods. Plants can be watered and feed by merely pouring solution into the reservoir every few days. The pans take up very little vertical space and are easy to handle and move around.

In a traditional hydroponic method, pots are filled with lava/ vermiculite mix of 4 to 1. Dolite Lime is added, one Tbs. per gallon of growing medium. This medium will wick and store water, but has excellent drainage and air storage capacity as well. It is however, not very reusable, as it is difficult to recapture and sterilize after harvest. Use small size lava, 3/8" pea size, and rinse the dust off it, over and over, until most of it is gone. Wet the vermiculite (dangerous dry, wear a mask) and mix into pots. Square pots hold more than round.

Vermiculite will settle to bottom after repeated watering from the top, so only water from the top occasionally to leach any mineral deposits, and put more vermiculite on the top than the bottom. Punch holes in the bottom of the pots, and add water to the pan. It will be wicked up to the roots and the plants will have all they need to flourish.

The reservoir is filled with 1 1/2 - 3 inches of water and allowed to recede between waterings. When possible, use less solution and water more often, to pull more oxygen to the roots faster over time. If you go away on vacation, simply fill the reservoirs full to the top, and the plants will be watered for 2 weeks at least.

One really great hydroponic medium is Oasis floral foam. Stick lots of holes into it to open it up a little, and start plants/clones in it, moving the cube of foam to rockwool later for larger growth stages. Many prefer floral foam, as it is inert, and adds no PH factors. It's expensive though, and tends to crumble easily. I'm also not sure it's very reusable, but it seems to be a popular item at the indoor gardening centers.

Planting can be made easier with hydroponic mediums that require little setup such as rockwool. Rockwool cubes can be reused several times, and are premade to use for hydroponics. Some advantages of rockwool are that it is impossible to over water and there is no transplanting. Just place the plant's cube on top of a larger rockwool cube and enjoy your extra leisure time.

Some find it best to save money by not buying rockwool and spending time planting in soil or hydroponic mediums such as vermiculite/lava mix. Pearlite is nice, since it is so light. Pearlite can be used instead of or in addition to lava, which must be rinsed and is much heavier.

But rockwool has many advantages that are not appreciated until you spend hours repotting; take a second look. It is not very expensive, and it is reusable. It's more stable than floral foam, which crunches and powders easily. Rockwool holds 10 times more water than soil, yet is impossible to over-water, because it always retains a high percentage of air. Best of all, there is no transplanting; just place a starter cube into a rockwool grow cube, and when the plant gets very large, place that cube on a rockwool slab. Since rockwool is easily reused over and over, the cost is divided by 3 or 4 crops, and ends up costing no more than vermiculite and lava, which is much more difficult to reclaim, sterilize and reuse (repot) when compared to rockwool. Vermiculite is also very dangerous when dry, and ends up getting in the carpet and into the air when you touch it (even wet), since it dries on the fingers and becomes airborne. For this reason, I do not recommend vermiculite indoors.

Rockwool's disadvantages are relatively few. It is alkaline PH, so you must use something in the nutrient solution to make it acidic (5.5) so that it brings the rockwool down from 7.7, to 6.5 (vinegar works great.) And it is irritating to the skin when dry, but is not a problem when wet.

To pre-treat rockwool for planting, soak it in a solution of fish emulsion, trace mineral solution and phosphoresic acid (PH Down) for 24 hours, then rinse. This will decrease the need for PH worries later on, as it buffers the rockwool PH to be fairly neutral.

Hydroponics should be used indoors or in greenhouses to speed the growth of plants, so you have more bud in less time. Hydroponics allows you to water the plants daily, and this will speed growth. The main difference between hydroponics and soil growing is that the hydroponic soil or "medium" is made to hold moisture, but drain well, so that there are no over-watering problems associated with continuous watering. Also, hydroponically grown plants do not derive nutrients from soil, but from the solution used to water the plants. Hydroponics reduces worries about mineral buildup in soil, and lack of oxygen to suffocating roots, so leaching is usually not necessary with hydroponics.

Hydroponics allows you to use smaller containers for the same given size plant, when compared to growing in soil. A 3/4 gallon pot can easily take a small hydroponically grown plant to maturity. This would be difficult to do in soil, since nutrients are soon used up and roots become cut-off from oxygen as they become root-bound in soil. This problem does not seem to occur nearly as quickly for hydroponic plants, since the roots can still take up nutrients from the constant solution feedings, and the medium passes on oxygen much more readily when the roots become bound in the small container.

Plant food is administered with most waterings, and allows the gardener to strictly control what nutrients are available to the plants at the different stages of plant growth. Watering can be automated to some degree with simple and cheap drip system apparatus, so take advantage of this when possible.

Hydroponics will hasten growing time, so it takes less time to harvest after planting. It makes sense to use simple passive hydroponic techniques when possible. Hydroponics may not be desirable if your growing outdoors, unless you have a greenhouse.

CAUTION: it is necessary keep close watch of plants to be sure they are never allowed to dry too much when growing hydroponically, or roots will be damaged. If you will not be able to tend to the garden every day, be sure the pans are filled enough to last until next time you return, or you can easily lose your crop.

More traditional hydroponic methods (active) are not discussed here. I don't see any point in making it more difficult than it needs to be. It is necessary to change the solution every month if your circulating it with a pump, but the reservoir system does away with this problem. Just rinse the medium once a month or so to prevent salts build up by watering from the top of the pot or rockwool cube with pure water. Change plant foods often to avoid deficiencies in the plants. I recommend using 2 different plant foods for each phase of growth, or 4 foods total, to lessen chances of any type of deficiency.

Change the solution more often if you notice the PH is going down quickly (too acid). Due to cationic exchange, solution will tend to get too acid over time, and this will cause nutrients to become unavailable to the plants. Check PH of the medium every time you water to be sure no PH issues are occurring.

Algae will tend to grow on the medium with higher humidities in hydroponics. It will turn a slab of rockwool dark green. To prevent this, use the plastic cover the rockwool came in to cover rockwool slab tops, with holes cut for the plants to stick out of it. It's easy to cut a packaged slab of rockwool into two pieces, then cut the end of the plastic off each piece. You now have two pieces of slab, each covered with plastic except on the very ends. Now cut 2 or 3 4" square holes in the top to place cubes on it, and place each piece in a clean litter pan. Now your ready to treat the rockwool as described above in anticipation of planting.

If growing in pots, a layer of gravel at the top of a pot may help reduce algae growth, since it will dry very quickly. Algae is merely messy and unsightly; it will not actually cause any complications with the plants.

RECYCLING

Use pots made from squarish containers such as plastic water jugs, etc. More plants will fit in less space and have more rooting area if square containers are used. This makes your garden a recycling center, and saves you tons of money.

2-liter soda bottles work great, but are not square. 13 will fit in a kitty litter box, and these will take a 3 foot plant to maturity hydroponically. If you can get 4 litter boxes in a closet, you can grow 52 plants like this vegetatively. Spread them out more for flowering.

Old buckets, plastic 3-5 gallon containers (food and paint industries, try painters' and restaurant dumpsters), paper paint buckets, old plastic garbage cans of all sizes, and garbage bags have all been used successfully by growers.

Do not use paper milk cartons and juice cartons for reservoir hydroponics, since these are difficult to sterilize, and they introduce fungus into your reservoir trays. Inert materials, such as plastic is best.

Be sure to sterilize all containers before each planting with a chlorine bleach solution of 2 tbsp. of bleach to one gallon of water. Let container and medium such as rockwool soak for several hours in the solution before rinsing thoroughly.

PLANTING OUTDOORS

Outdoor growing is the best. Outdoor pot by far is the strongest, since it gets more light, it's naturally more robust. No light leak problems. No dark periods that keep you out of your grow room. No electricity bills. Sunlight tends to reach more of the plant, if your growing in the direct sun. Unlike growing indoors, the bottom of the plant will be almost as developed as the top.

Outdoors, outside of a greenhouse, there are many factors that can kill your crop. Deer will try to eat them. Chipmunks and rodents too. Bugs will inhabit them, and the wind and rain can whip your little buds to pieces if they are exposed to strong storms. For this reason, indoor pot can be better than outdoor, but the best smoke I ever tasted was outdoor pot, so that tells you something; nothing beats the sun.

Put up a fence and make sure it stays up. Visit your plot at least once every two weeks, and preferably more often if water needs demand.

It's a good idea to use soil if you don't have a green house, since hydroponics will be less reliable outside in the open air, due mostly to evaporation.

Light exposure is all important when locating a site for a greenhouse or outdoor plot. A backyard grower will need to know where the sun shines for the longest period; privacy and other factors will enter in as well. Try to find an innocuous spot that gets full winter sun from mid morning to mid afternoon, at least from 10-4, preferably 8-5. This will be really asking for a lot if you live north of 30 degrees latitude since days are short in winter. Since most gardeners will not want to use the greenhouse in the middle of the winter, you can still use winter sun as an indicator of good spring and fall lighting exposures. Usually the south side of a hill gets the most sun. Also, large areas open to the sun on the north side of the property will get good southern exposures. East and West exposures can be good if they get the full morning/afternoon sun and mid-day sun as well. Some books say the plants respond better to morning-only sun, verses afternoon-only sun, so if you have to choose between the two, morning sun may be better.

Disguise your greenhouse as a tool shed, or similar structure, by using only one wall and a roof of white opaqued plastic, PVC, Filon, or glass, and using a similar colored material for the rest of the shed, or painting it white or silvery, to look like metal. Try to make it appear as if it has always been there, with plants and trees that grow around it and mask it from view while allowing sun to reach it.

Filon (corrugated fiberglass) or PVC plastic sheets can be used outside to cover young plants grown together in a garden. Buy the clear greenhouse sheets, and opaque them with white wash (made from lime) or epoxy resin tinted white or grey and painted on in a thin layer. This will pass more sun than white PVC or Filon, and still hide the plants. Epoxy resin coats will preserve the Filon for many more seasons than it would otherwise last. It will also allow you

to disguise the shed as metal, if you paint the clear filon sheets with a thin layer of resin tinted light grey. Paint will work as well, but may not protect as much. Be careful to use only as much as needed, to reduce sun blockage to a minimum.

Dig a big hole, don't depend on the plant to be able to penetrate the clay and rubble unless your sure of the quality of topsoil in the area. Grassy fields would have good top soil, but your back yard may not. This alone can make the difference between an average 5' tall plant, and a 10' monster by harvest time. Growing in the ground will always beat a pot, since the plant will never become root bound in the ground. Plants grown in the ground should grow much larger, but will need more space for each plant, so plan accordingly, you can't move them once they're in!

You may want to keep outdoor plants in pots so they can be easily moved. A big hole will allow the pot to be place in it, thus reducing the height of the plant, if fence level is an issue. Many growers find pots have saved a crop that had to be moved for some unexpected reason (repairman, appraiser, fire, etc.).

It's always best to put a roof over your plants outdoors. When I was a lad, we had plants growing over the fence line in the back yard. We started to build a greenhouse roof for them, and a cop saw us hauling wood, thought we were stealing it (which we were not) and looked over the fence at us and our lovely plants. We were busted, because he saw them. If he had seen a shed roof instead, there would never have been a problem. Moral of the Story: build the roof BEFORE the plants are sticking over the fence! Or train them to stay well below it. Live and learn...

When growing away from the house, in the wild, water is the biggest determining factor, after security. Water must be close by, or close to the soil surface, or you will have to pack water in. Water is heavy and this is very hard work. Try to find an area close to a source of water if possible, and keep a bucket nearby to carry water to your plot.

A novel idea in this regard is to find high water in the mountains, at altitude, and then route it down to a lower spot close by. It is possible to create water pressure in a hose this way, and route it to a drip system that feeds water to your plants continuously. Take a 5 gallon gas can, and punch small holes in it. Run a hose out of the main orifice and secure it somehow. Bury the can in a river or stream under rocks, so that it is hidden and submerged. Bury the hose coming out of it, and run it down hill to your garden area. A little engineering can save you a lot of work, and this rig can be used year after year.

GUERRILLA FARMING

Guerrilla farming refers to farming away from your own property, or in a remote location of your property where people seldom roam around. It is possible to find locations that for one reason or another are not easily accessible or are privately owned.

Try to grow off your property, on adjacent property, so that if your plot is found, it will not be traceable back to you. If it's not on your property, nobody has witnessed you there, and there is no physical evidence of your presence (footprints, fingerprints, trails, hair, etc.), then it is virtually impossible to prosecute you for it, even if the cops think they know who it belongs to.

Never admit to growing, to anyone. Your best defense is that your just passing through the area, and noticed something you decided to take a look at, or carry a fishing pole or binoculars and claim fishing or bird watching.

Never tell anyone but a partner where the plants are located. Do not bring visitors to see them, unless it is harvest time, and the plants will be pulled the same or following day.

Make sure your plants are out of sight. Take a different route to get to them if they are not in a secure part of your property, and cover the trail to make it look as if there is no trail. Make cut backs in the trail, so that people on the main trail will tend to miss the cut-back to the grow area. Don't park on the main road, always find a place to park that will not arouse suspicion by people that pass on the road. Have a safe house in the area if you are not planting close to

home. Always have a good reason for being in the area and have the necessary items to make your claim believable.

Briar and poison oak patches are perfect if you can cut through it. Poison Oak must be washed away before an allergic reaction takes place. Teknu is a special soap solution that will deactivate poison oak before it has time to create a reaction. Apply Teknu immediately after contact and take a shower 30 mins. later.

Try to plant under trees, next to bushes and keep only a few plants in any one spot. Train or top the plants to grow sideways, or do something to prevent the classic Christmas tree look of most plants left to grow untrained. Tying the top down to the ground will make the plants branches grow up toward the sun, and increase yield, given a long enough growing season. Plants can be grown under trees if the sun comes in at an angle and lights the area for several hours every day. Plants should get at least 5 hours of direct sun every day, and 5 more hours of indirect light. Use shoes that you can dispose of later and cover your foot prints. Use surgical gloves and leave no fingerprints on pots and other items that might ID you to the fuzz...in case your plot is discovered by passers by.

Put up a fence, or the chipmunks, squirrels and deer will nibble on your babies until there is nothing left. Green wire mesh and nylon chicken fencing net work great and can be wrapped around trees to create a strong barrier. Always check it and repair every visit you make to the garden. A barrier of fishing line, one at 18" and another at 3' will keep most deer away from your crop.

Gopher Granola is available for areas such as the N. CA mountains, where wood rats and gophers will eat your crop if given any opportunity to do so. The best fence in the world will not keep rats away from your plants! Do not use soap to keep deer away, it will attract rats! (The fat in the soap is edible for them.) Put the poison grain in a feeder than only small rodents can enter, so that birds and deer can't eat it. Set out poison early, before actual planting. The rats must eat the grain for several days before it will have any effect on them. Ultimately, you may find it's easier to grow in a greenhouse shed in your own backyard rather than try to keep the rats from eating your outdoor plot.

When growing away from the house, in the wild, water is the biggest determining factor, after security. The amount you can grow is directly proportional to the water available. If you must pack-in water, carry it in a backpack in case your seen in-route to your garden; you will appear to be merely a hiker, not a grower.

Transporting vegetative starts to the growing area is a most tricky aspect of growing outdoors. Usually, you will want to start plant indoors, or outside in your garden, then transport them to the grow site once they are firmly established. It may be desirable to first detect and separate males from females so that no effort of transporting/transplanting/watering males is incurred. One suggestion is to use 3" rockwool cubes to start seedlings in, then put 20 of them in a litter pan, cover it with another pan, and transport this to the grow site. The cubes can be planted directly into soil. If spotted inroute to the grow area, burying a dead cat may be a good excuse for being in the area. Few people would demand to see the rotting corpse!

One outdoor grower we know has given up on seeds. He has several strains he likes to clone, so he starts 200 clones in his closet, then transports them outdoors in boxes to the grow site. No males, no differentiation, no weeding, no germinating seeds, no genetic uncertainties, no crops grown for seed, no transporting/transplanting/watering plants your just going to pull up later, no pollination nightmares, no wasted effort!

SOIL GROWING

Use Super Soil brand in California, as this is the only known soil on the West Coast that is guaranteed to be good. Many other brands are mostly wood products and have very few nutrients, are too moist, etc. Add vermiculite, perlite or sand to Super Soil to increase it's drainage and aeration.

Organic gardeners use their own compost prepared from a mixture of chicken, cow or other manure and household food waste, leaves, lawn clippings, dog hair and other waste products including urine, which is high in nitrogen. Dog hair is not recommended for guerilla

gardeners planting off their property where police could find it. DNA tests could prove it was YOUR dog's hair!

Use P4 water crystals in the soil to give the plants a few days worth of emergency water reserves. This substance swells up with water and holds it like a sponge, so that roots will have a reserve if harsh drought makes constant watering necessary. Go real easy on this stuff though, it tends to sink to the bottom of the pot and suffocate bottom roots (new growth roots) and stunts the plant. Use in extreme moderation, let it swell up for at least an hour before mixing with other soil.

Plant size in soil is directly related to pot size. If you want the plant to grow bigger, put it in a bigger pot. Usually, 1/2 gallon per foot of plant is sufficient. A six foot plant would require a minimum of a 3 gallon pot. Remember, square containers have more volume in a square space (like a closet).

Planting in the ground is always preferable when growing in soil. The plants can then grow to any size, unlimited by pot size.

Bat Guano, chicken manure, or worm castings can all be used to fertilize organically in soil. Manures can burn, so they should be composted with the soil first, before planting, over several weeks. Sea weed is available to provide a rich trace mineral source that breaks down slowly and constantly feeds the plants.

If growing outdoors in available soil, look around for leaves and other natural sources of nitrogen and work them into the soil, along with some dolomite lime and composted organic fertilizer. Even small amounts of plant food such as Miracle Grow can be added to soil at this time. (Organic gardeners frown upon this practice, however. Toxic wastes are produced by commercial fertilizer production.) Mulch can be made from leaves and spread out over the garden area to hold in moisture and keep down weeds near the plants.

SECURITY

Its interesting that pot plants really do blend in with other plants to the point that they are unidentifiable by all but the most observant. I remember a relative of the family on a visit to Texas showed me his corn in the garden and I was standing 3' away from several pot plants before I recognized them for what they were.

Plants started outdoors late in the season never get very big and never attract the least bit of attention when placed next to plants of similar or taller stature. Even tall plants grown among several trees will be almost invisible in their camouflage.

Outdoors the object is to control access to an area, and not to arouse suspicion. Tuck them here and there, never in a recognizable pattern. Space them out, and fit them in to the existing landscape such that they get full sun, but they're hidden or blend in. Fence lines and groups of several together are best. Try to find strains that seem to match the surrounding plants. Feed nitrogen to your plants if they need to be greener to blend in. Some growers even use plastic red flowers, pinned to a plant, disguising it as a flower bush.

Visit the plants at night on full moons, and if your visible to neighbors, appear to be pruning a tree, mowing the lawn, or doing something in the yard that makes you invisible.

Dig a hole and put a potted plant in it. The plant's height will be reduced by at least a foot. Some growers top the plant when it is 12" high, and grow the 2 tops horizontally along a trellis. The plant will never be over 3 feet tall, and never arouses suspicion from neighbors. This type of plant can even be grown in your yard in full view. Many stories abound of having the neighbors over for a BBQ and nobody ever noticed the nice plants over by the fence...

PLANT FOOD AND NUTRIENTS

Plant foods have 3 main ingredients that will be the mainstay of the garden, Nitrogen, Phosphorus, and Potassium. These 3 ingredients are usually listed on the front label of the plant food in the order of N-P-K. A 20-20-20 plant food has a Nitrogen level of 20%. Secondary nutrients are Calcium, Sulfur and Magnesium. In trace quantities, boron, copper, molybdenum, zinc, iron, and manganese.

Depending on stage of growth, different nutrients are needed at different times. For rooting and germination, levels of high P nutrients with less N/K are needed. Vegetative growth needs lots of N, and human urine is one of the better sources, (mix 8 ounces to 1 gallon water), although it is not a complete fertilizer unto itself. 20-20-20 with trace elements should do it; I like Miracle Grow Patio food. Watch for calcium, magnesium, sulfur and iron levels too. These are important. One tablespoon of dolomite or hydrated lime is used per gallon of growing medium when a hydroponic medium is first brought on-line, to provide nitrogen, calcium and magnesium. Epsom salts are used to enhance magnesium and sulfur levels in solution.

Tobacco grown with potassium nitrate burns better. Plant foods with PN (P2N3) are foods such as Miracle Grow. This is an excellent fertilizer for vegetative growth, or through the flowering cycle as well. Consider however, potassium nitrate is also known as Salt Peter, and is used to make men have less sexual desire or impotent, such as in mental institutions. So if certain plants are destined for cooking, you might use Fish Emulsion or some other totally organic fertilizer on these plants, at least in the last weeks of flowering.

Most hydroponic solutions should be in the range of 150-600 parts per million in dissolved solids. 300-400 PPM is optimum. It is possible to test your solution or soil with a electrical conductivity meter if your unsure of what your giving your plants.

Keep in mind most dissolved solids readings are usually on the low side, and actual nutrient levels are usually higher. It is possible with passive hydroponics, to get nutrient build-up over several feedings, to the point the medium is over saturated in nutrients. Just feed straight water now and again, until you notice the plants are not as green (slightly), then resume normal feeding.

"Pumping" is when you use more waterings to make the plants grow faster. This is dangerous if you proceed in a reckless manner, due to potential over-watering problems. You must go slowly and watch the plants daily and even hourly at first to be sure your not over-watering the plants. Use weaker plant food mixtures than normal, maybe 25%, and be sure your leaching once a month and running straight water through the plants at least every other time you water. This applies mainly to plants grown in soil mediums.

Use of light strength Oxygen Plus plant food (or Food Grade Hydrogen Peroxide) allows the roots to breath better and prevents problems with over-watering. Check soil to be sure there are no PH anomalies that might be due to Hydrogen Peroxide in the solution. (One experienced grower told me he would not use H2O2 (HP) due to possible PH problems. This should not be a problem if your checking PH and correcting for it in watering solutions.) Be sure your medium has good drainage. At this point, if your watering soil based plants once a week, you can water every 3-5 days instead if you plant them in a medium with better drainage. Perlite or lava rock will greatly increase the drainage of the medium and make watering necessary more often. This will pump the plants; they will tend to grow faster because of the enhanced oxygen to the roots. Make sure the plant medium is almost dry before watering again, as the plant grows faster this way.

An alternative is to use a standard plant food mixture (stronger) once every 3 waterings. The nutrients are suspended in the medium and stored in the soil for later use. The nutrients are washed out by 2 straight waterings afterward and there is no salts build up in the soil. (Does not apply to hydroponics.)

Stop all plant food 2 weeks before harvesting, so that the plants don't taste like plant food. (This applies to hydroponics as well.)

WARNING: Do not over-fertilize. It will kill your plants. Always read the instructions for the fertilizer being used. Use 1/2 strength if adding to the water for all feedings in soil or hydroponics if you are unsure of what your plants can take. Build up slowly to higher concentrations of food over time. Novice soil growers tend to over-fertilize their plants. Mineral salts build up over time to higher levels of dissolved solids. Use straight water for one feeding in hydroponics if it is believed the buildup is getting too great. Leach plants in pots every month. If your plants look REALLY green, withhold food for a while to be sure they are not being over-fed.

PH AND FERTILIZERS

PH can make or break your nutrient solution. 6.7-6.2 is best to ensure there is no nutrient lock-up occurring. Hydroponics requires the solution to be PH corrected for the medium before exposing to the plants. Phosphoric acid can make the PH go down; lime or potash can take it up when it gets too acid. Buy a PH meter for \$10 and use it in soil, water, and hydroponic medium to make sure your not going alkaline or acid over time. Most neutral mediums can use a little vinegar to make them just this side of 7 pH to 6.5 or so.

Most fertilizers cause a pH change in the soil. Adding fertilizer to the soil almost always results in a more acidic pH.

As time goes on, the amount of salts produced by the breakdown of fertilizers in the soil causes the soil to become increasingly acidic and eventually the concentration of these salts in the soil will stunt the plant and cause browning out of the foliage. Also, as the plant gets older its roots become less effective in bringing food to the leaves. To avoid the accumulation of these salts in your soil and to ensure that your plant is getting all of the food it needs you can begin leaf feeding your plant at the age of about 1.5 months. Dissolve the fertilizer in worm water and spray the mixture directly onto the foliage. The leaves absorb the fertilizer into their veins. If you want to continue to put fertilizer into the soil as well as leaf feeding, be sure not to overdose your plants.

FOLIAR FEEDING

Foliar feeding seems to be one of the easiest ways of increasing yield, growth speed, and quality in a well vented space, with or without elevated CO2 levels. Just prepare a tea of worm castings, fish emulsion, bat guano, or most any other plant food right for the job and feed in vegetative and early flowering stages. It is not recommended for late flowering, or you will be eating the sprayed-on material later. Stop Foliar feeding 2-3 weeks before harvesting. Wash off the leaves with straight water every week to prevent clogging the stomata of the leaves. Feed daily or every other day.

Best times of day to Foliar feed are 7-10Am and after 5 in the evening. This is because the stomata on the underside of the leaves are open then. Also, the best temperature is about 72 degrees, and over 80, they may not be open at all. So find the cooler part of the day if it's hot, and the warmer part of the day if it's cold out. You may need to spray at 2AM if that's the coolest time available. The sprayer used should atomize the solution to a very fine mist; find your best sprayer and use it for this. Make sure the PH is between 7 and 6.2. Use baking soda to make the solution higher PH, and vinegar to make the solution lower PH. It's better to spray more often and use less, than to drench the plants infrequently. Use a wetting agent to prevent the water from beading up, and thereby burning the leaves as they act as small prisms. Make sure you don't spray a hot bulb; better yet, spray only when the bulb has cooled.

Perhaps the best Foliar feeding includes using seltzer water and plant food at the same time. This way, CO2 and nutrients are feed directly to the leaves in the same spray.

Foliar feeding is recognized in most of the literature as being a good way to get nutrients to the plant later when nutrient lockup problems could start to reduce intake from the roots.

WARNING!: It is important to wash leaves that are harvested before they are dried, if you intend to eat them, since they may have nitrate salts on them.

NOTE: One grower who reviewed this document comments: "Fish emulsion smells. Bat guano could be highly unsanitary. Stick to the Rapid-Gro, MgSO4 (Epsom salts), hydroponic trace element solution. Nitrate salts (The "N" in NPK) are unhealthy to smoke. Personally, I never Foliar feed."

Above is a great comment, and there is great wisdom in an organic, non-toxic garden.

Personally, I use only CO2 on my indoor hydroponic plants, and never Foliar feed. It simply does not seem to be necessary when using hydroponics.

CO2

Elevating carbon dioxide levels can increase growth speed a great deal, perhaps even double it. It seems that the plant evolved in primordial times when natural CO2 levels were many times what they are today. The plant uses CO2 for photosynthesis to create sugars it uses to build plant tissues. Elevating the CO2 level will increase the plants ability to manufacture these sugars and plant growth rate is enhanced considerably.

CO2 can be a pain to manufacture safely, cheaply, and/or conveniently, and is expensive to set up if you use a CO2 tank system. CO2 is most usable for flowering, as this is when the plant is most dense and has the hardest time circulating air around its leaves. If your strictly growing vegetatively indoors, (transferring your plants outdoors to flower), then CO2 will not be a major concern unless you have a sealed greenhouse, closet or bedroom, and wish to increase yield and decrease flowering time.

For a medium sized indoor operation, one approach is to used CO2 canisters from welding supply houses. This is expensive initially, but fairly inexpensive in the long run. These systems are good only if your area is not too big or too small.

The basic CO2 tank system looks like this:

20 lb. tank \$100

Regulator \$159

Timer or controller \$10-125

Fill up \$15-20

Worst case = \$395 for CO2 tank setup synced to a exhaust fan with a thermostat.

CO2 is cheaply produced by burning Natural Gas. However, heat and Carbon Monoxide must be vented to the outside air. CO2 can be obtained by buying or leasing cylinders from local welding supply houses. If asked, you can say you have an old mig welder at home and need to patch up the lawnmower (trailer, car, etc.)

For a small closet, one tank could last 2 months, but it depends on how much is released, how often the room is vented, hours of light cycle, room leaks, enrichment levels and dispersion methods. This method may be overkill for your small closet.

It is generally viewed as good to have a small constant flow of CO2 over the plants at all times the lights are on, dispersed directly over the plants during the time exhaust fans are off. Opportunities exist to conserve CO2, but this can cost money. When the light is off you don't need CO2, so during flowering, you will use half as much if you have the CO2 solenoid setup to your light timer. When the fan is on for venting, CO2 is shut off as well. This may be up to half the time the light is on, so this will affect the plants exposure times and amount of gas actually dispensed.

Environmentally, using bottled gas is better, since manufacturing it adds to greenhouse effect, and bottled CO2 is captured as part of the manufacturing process of many materials, and then recycled. Fermenting, CO2 generators, and baking soda and vinegar methods all generate new CO2 and add to greenhouse effect.

CO2 generation from fermentation and generators is possible. A simple CO2 generator would be a propane heater. This will work well, as long as the gases can be vented to the grow area, and a fan is used to keep the hot CO2 (that will rise) circulating and available below at the plants level. Fire and exhaust venting of the heat are issues as well. A room that must be vented 50% of the time to rid the environment of heat from a lamp and heater will not receive as much CO2 as a room that can be kept unvented for hours at a time. However, CO2 generators are the only way to go for large operations.

Fermentation or vinegar over baking soda will work if you don't have many vent cycles, but if you have enough heat to make constant or regular venting necessary, these methods become impractical. Just pour the vinegar on baking soda and close the door, (you lose your CO2 as soon as the vent comes on). This method leaves a great deal to be desired, since it is not easy to regulate automatically, and requires daily attention. It is possible however, to create CO2 by fermentation, let the wine turn to vinegar, and pour this on baking soda. It's the most cost-effective setup for most closet growers, for whom \$400 in CO2 equipment is a bit much to swallow.

In fermentation, yeast is constantly killing itself; it takes a lot of space. You need a big bin to constantly keep adding water to, so that the alcohol levels will not rise high enough to kill the yeast. Sugar is used quickly this way, and a 10 pound sack will run \$3.50 or so and last about 2-3 weeks. This is also difficult to gauge what is happening as far as amounts actually released. A tube out the top going into a jar of water will bubble and demonstrate the amount of CO2 being produced.

Try sodium bicarbonate mixed with vinegar, 1 tsp.: ~30cc- this will gush up all frothy as it releases CO2. do it just before you close the door on your plants. A MUCH cheaper way to provide CO2 is 2 Oz sugar in 2 liters of water in a bottle [sterilized 1st with bleach and water, then rinsed], plus a few cc urine[!] or if you insist, yeast nutrient from a home brewing supplier. Add a brewing yeast, shake up and keep at 25 deg Celsius[~70 F] . Over next 2 weeks or so it will brew up about 1/2 Oz CO2 for every Oz sugar used. Keep a few going at once, starting a new one every 3 days or so. With added CO2 growth is phenomenal!!! I personally measured 38cm growth in 8 days under a 250watt HPS bulb[tubular clear, Horizontal mount.

A good container is a 1 gallon plastic milk jug, with a pin-hole in the cap. Also, the air-lock from a piece of clear tube running into a jar filled with water will keep microbes out and demonstrate the fermentation is working.

A variation is to spray seltzer water on the plants twice a day. This is not recommended by some authorities, and receives great raves by people who seem to feel it has enhanced their crop. It stands to reason this would work for only a small unvented closet, but may be right for some situations. It could get expensive with a lot of plants to spray. Use seltzer, not club soda, since it contains less sodium that could clog the plants stomata. Wash your plants with straight water after 2 or 3 seltzer sprays. It's a lot of work, and you can't automate it, but maybe that's good! Remember, being with the plants is a beautiful experience, and brings you closer to your spiritual self and the earth. Seltzer is available at most grocery stores (I get it at Lucky's @ .79 for a 2 liter bottle). Club soda will work if seltzer water is not available; but it has twice as much sodium in it. A very diluted solution of Miracle Grow can be sprayed on the plant at the same time. One factor of using seltzer water is it raises humidity levels. Make sure your venting humidity during the dark cycle, or you could risk fungus and increased internode length.

CAUTION: Don't spray too close to a hot bulb! Spray downward only, or turn off the lamp first.

Even though CO2 enrichment can mean 30-100% yield increases, the hassle, expense, space, danger, and time involved can make constant or near constant venting a desirable alternative to enrichment. As long as the plant has the opportunity to take in new CO2 at all times, from air that is over 200 PPM CO2, the plants will have the required nutrients for photosynthesis. Most closets will need new CO2 coming in every two or three hours, minimum. Most cities' will have high concentrations of CO2 in the air, and some growers find CO2 injection unnecessary in these circumstances.

Some growers have reported to High Times that high CO2 levels in the grow room near harvest time lower potency. It may be a good idea to turn off CO2 2 weeks before harvesting.

VENTING

You have to vent a lot with a HID lamp, less so for fluorescence. Also, humidity build up requires that you vent at least a few times per day. For a room with a hot lamp that builds up heat quickly, the best vent would be one that cleared the room in 5 minutes, then would stop for 25 minutes before venting again, or similarly, vent 3 minutes, shut off 12 minutes, etc. The trick is to find a timer that will do this sort of thing. Not easy to find and not cheap. Once you need to regulate CO2 on and off inversely with the fan, your looking at a \$100 climate controller.

Alternatives are a thermostat that turns on a fan when a certain temperature is reached, and turns it off when the temp recedes 4 degrees. But it is a bitch to coordinate CO2 release with this one, since you don't know when the fan goes on. \$39 for this thermostat, but to sync it to

CO2 with a voltage sensing relay is \$100 for the ready-made switch, so then the environment controller at \$100 is cheaper. All you really want is a fan that clears the air in a few minutes, a temperature switch that turns on and off the fan, and an inverse switch that turns off and on the CO2. If you can vent the room really quick and the heat does not build up too quickly, the CO2 could be run in a slow, continuous fashion, and would build up in-between the occasional quick exhaust cycles.

Two timers synced can be used, but the only ones cheaply available are the 30 min interval, 48 trips per 24 hours. So I could have a fan run 30 mins on, then 30 mins off. I could also sync it to the light so that I don't vent when the lamp is off. I can sync this to an identical timer that will turn on CO2 during the time that the fan is not on, and vice versa. It would be difficult to sync them closer than 5-10 mins, but at least there would be a possible inexpensive solution. \$20 for two of these timers.

Fans are expensive to buy for venting, but I just go down to the local electronic parts liquidators and they have muffin fans for \$5-10, so that's a real savings over the \$50-70 these fans cost new at the indoor garden stores. A good vent fan will keep the humidity and temperature down, and distribute CO2 to your plants from new incoming air.

Internal air movement is very necessary as well. An oscillating fan should be used to circulate air within the growroom, to help circulate CO2. It will also keep the humidity down, allowing the air to absorb more moisture, and reduce risk of fungus. A wall mount oscillating fan will not take valuable floor space. The best grow rooms have the most internal air circulation.

TEMPERATURE

Proper temperature is one highly variable factor. Most books state optimum grow temperature to be 70-80 degrees, but many list extenuating circumstances that allow temperatures to go higher. Assuming genetics is not a factor, plants seem to be able to absorb more light at higher temps, perhaps up to 90 degrees. High light and CO2 levels could make this go as high as 95 degrees for increased growth speed.* An optimum of 95 degrees is new data that assumes very-high light, CO2 enrichment of 1500 PPM and good regular venting to keep humidity down. It is not clear if these temperatures will reduce potency in flowers. It may be a good idea to reduce temperatures once flowering has started, to preserve potency, even if it does reduce growth speed. But higher temperatures will make plants grow vegetatively much faster, by exciting the plants metabolism, assuming the required levels of CO2 and light are available, and humidity is not allowed to get too high.

With normal levels of CO2, in a well vented space, 90 degrees would seem to be the absolute max, while 85 may be closer to optimum, even with a great deal of light available. Do not let the room temperature get over 35 C (95 F) as this hurts growth. Optimal temperature is 27-30 C (80-86 F) if you have strong light with no CO2 enrichment. Less than 21 C (70 F) is too cold for good growth.

Low temperatures at night are OK down to about 60 degrees outdoors, then start to effect the growth in a big way. Mid 50's will cause mild shock and 40's will kill your plants with repeated exposure. Keep your plants warm, especially the roots. Elevate pots if you think the ground is sucking the heat out of the roots. This is an issue if you have a slab or other type of cold floor.

As temperature goes up, so does the ability of the air to hold water, thus reducing humidity, so a higher average temperature should reduce risk of fungus.

Contrary to many reports, high humidity is not good for plants except during germination and rooting. Lower humidity levels help the plant transpire CO2 and reduce risk of molds during flowering.

Studies indicate the potency of buds goes down as the temperature goes up, so it is important to see that the plants do not get too hot during flowering cycles.

* D. Gold: CO2, Temperature and Humidity, 1991 Edited by E. Rosenthal.

PESTS

You really have to watch pests, or all your efforts could result in little or nothing in return. Mites and Aphids are the worst; whiteflies, caterpillar and fungi are the ones to watch out for long term. Pyrethrum bombs can start you with a clean slate in the room, and then homemade or commercial soap sprays will do most of the rest. When bringing in plants from outside, pyrethrum every broad leaf top and bottom and the soil too. Then watch them closely for a week or two, and soap down any remaining bug life you find from eggs being hatched. This should do the trick for a month or two, long enough it won't be an issue before harvesting. Fungus is another obstacle in the path of a successful growing season. When the flowers are roughly half developed they become susceptible to a fungus or bud rot. It appears that growing conditions for the fungus are best when temperatures are between 60 and 80 degrees and the humidity is high. The fungus is very destructive and spreads quickly. It is a spore type of fungus that travels to other buds via the wind so it is impossible to prevent or stop if weather conditions permit it to grow. If things should go badly and the fungus starts to attack your plants, you must remove it immediately or it will spread to other areas of the plant or plants.

Some growers will remove just the section of the bud that is infected whereas other growers will remove the entire branch. Removal of the entire branch better insures that the fungus is totally removed, and also enables the grower to sample the crop a few weeks ahead of time. Fungi can wipe your crop quick, so invest in some SAFE fungicide and spray down the plants just before flowering if you think fungus may be a problem. Don't spray the plants if you have never had problems with fungus before. Keep humidity down, circulate air like crazy in the grow space and keep unquarantined outdoor plants out of the indoor space. Don't wait until after flowering, since it's not a good idea to apply the fungicide directly to flowers. Instead, flowers must be cut off when they are infected.

Most fungicides are very nasty, and you won't want to ingest them, so it is necessary to use one that is safe for vegetables. Safer makes a suitable product that is available at most nurseries; it contains only sulfur in solution.

Use soap solution like Safer Insecticidal Soap to get rid of most aphid problems. Use some tobacco juice and chili pepper powder added to this for mites. Dr. Bronnars Soap can be used with some dish detergent in a spray bottle if you want to save money.

Pyrethrum should only be used in extreme circumstances directly on plants, but can be used in a closet or greenhouse in the corners to get rid of spiders and such. It breaks down within a week to non-toxic elements, and can be washed from a plant with detergent solutions and then clear water. I find Pyrethrum to be the best solution for spider mites, if it is sprayed on young plants up to early flowering. Into later flowering, the tobacco and pepper/soap solution is your best bet, on a daily basis, on the under-sides of all infected leaves.

Spider mites are by far the worst offender in my garden. I have finally learned not to bring plants from outside into the indoor space. They are always infected with pests and threaten to infect the entire indoor grow space. It is much more practical to work WITH the seasons and regenerate plants outdoors in the Summer, rather than bringing them indoors to regenerate under constant light. Start a plant indoors, take it outside in Spring to flower. Take a harvest or two, feed it nitrogen all Summer and it will regenerate naturally, to be flowered again in the Fall.

Once a plant has been taken outside, leave it outside.

TRANSPLANTING

There will be little or no shock if you are quick and tender in your handling of the plants. Make sure you only need to transplant twice, or better yet, once if possible, through the entire growth cycle. Transplanting slows you down. It takes time, it's tricky, it's hard work, and threatens the plants. Start in as large a container as possible, square is best. 16 ounce plastic cups work OK, and 2 liter soda bottles cut down may be big enough for the first harvest when growing hydroponically. One-gallon plastic milk or water containers (squarish) will work too.

Or start seeds and rooted cuttings in 16oz plastic cups. It's better to have less seedlings than it is to have many seedlings that need constant transplanting. These larger cups take only a little more space, and allow you to transplant only one time before harvesting the first crop. Transplant into a gallon water jugs (cut down to 3/4 gallon) before forcing flower growth. To regenerate this plant after harvesting, transplant it into a larger pot after it goes into vegetative growth once again, 5 gallon paint buckets work pretty well if you can spare the space, and a 2-3 gallon container would make this plant's 2nd harvest better than the first, given enough vegetative regrowth first.

One more tip:

A Russian study showed that seedlings with at least 4" of soil to grow the tap root were more likely to go female. The source I'm quoting says "This may be why some farmers get female/male ratios as great as 80%/20%."

EARLY SEXING

It's possible to tell the sex of a plant early, and thus move male plants out of the main growing area sooner by covering a plant's lower branch for 12 hours a day while it's in a constant light vegetative state. Use a black paper bag or equivalent to allow for air flow while keeping out light. Be sure to set up a regular cycle for these covered branches. If light is allowed to reach them during the dark period, they may not indicate early at all.

Use a magnifying glass to look at the early flowers sex type. A male plant will have a small club (playing card) looking preflower with a small stem under it. A female flower is usually a single or double pistil, white and wispy, emerging from an immature calyx.

Some people like to pre-force plants when they are 8" tall, in order to weed out the males.

When growing outdoors, many growers do not wish to devote time, space or energy to male plants. Just put the plants on a 12 hours light cycle for 2 weeks, separate the females from the males, then revert the light cycle back to 18-24 hours to continue vegetative growth for the females. Keep in mind, this is a time consuming process and can put the plants back 2 weeks in growth. Don't pre-force plants unless you have lots of time. Just cover one branch per plant with black paper (light tight, breaths air) 12 hours every day under constant light to force pre-flowers and differentiate early.

REGENERATION

It is possible to harvest plants and then rejuvenate them vegetatively for a 2nd and even 3rd harvest. A second harvest can be realized in as little as 6-8 weeks. Since the plant's stalk, and roots are already formed, the plant can produce a second, even third harvest of buds in a little more than half the time of the original harvest. When harvesting, take off the top 1/3rd of the plant. Leave most healthy fan leaves in the middle of the plant, cutting buds off branches carefully. On the lower 1/3rd of the plant, take off end flowers, but leave several small flowers on each branch. These will be the part of the plant that is regenerated. The more buds you leave on the plant, the faster it will regenerate. Feed the plant some Miracle Grow or any high nitrogen plant food immediately after harvest. When you intend to regenerate a plant, make sure it never gets too starved for nitrogen as it is maturing, or all the sun leaves will fall off, and your plant will not have enough leaves to live after being harvested.

Harvested plants can come inside for rejuvenation under continuous light or are left outside in Summer to rejuvenate in the natural long days. It will take 7-14 days to see signs of new growth when regenerating a plant. As stated before, and in contrast to normal growth patterns, lower branches will be the first to sprout new vegetative growth. Allow the plant to grow a little vegetatively, then take outside again to reflower. Or keep inside for vegetative cuttings. You now have two or three generations of plants growing, and will need more space outside. But you will now be harvesting twice as often. As often as every 30 days, since you have new clones or seedlings growing, vegetative plants ready to flower, and regenerated plants flowering too.

Regenerating indoors can create problems if your plants are infected with pests. It may be best to have a separate area indoors that will not allow your plants to infect the main indoor area. An alternative to regenerating indoors is to regenerate outdoors in the Summer. Just take a harvest in June, then allow the plant to regenerate by leaving some lower buds on the plant, and leaving the middle 1/3rd of the plant's leaves at harvest. Feed it nitrogen, and make sure it gets lots of sun. It will regenerate all Summer and be quite large by Fall, when it will start to flower again naturally.

PRUNING

Plants that are regenerated, cloned and even grown from seed will need to be pruned at some point to encourage the plant to produce as much as possible and remain healthy. Pruning the lower limbs creates more air-flow under the plants in an indoor situation and creates cuttings for cloning. It also forces the plant's effort to the top limbs that get the most light, maximizing yields.

Plants that are regenerated need to have minor growth clipped so that the main regenerated growth will get all the plant's energy. This means that once the plant has started to regenerate lots of growth, the lower limbs that will be shaded or are not robust should go. The growth must be thinned on top branches such that only the most robust growth is allowed to remain. Once nice aspect of regenerating plants is that some small buds left on the plant in anticipation of regeneration will not sprout new growth and may be collected for smoke. The plant may provide much smokable material if it is caught before all the old flowers dry up and die with the new vegetative growth occurring.

Try to trim a regenerated plant twice. Once as it is starting to regenerate, collect any bud that is not sprouting with new growth and smoke it. Then later, prune again to take lower clippings to clone and thin the upper growth so that larger buds will be produced.

If a regenerated plant is not pruned at all, the resulting plant is very stemmy, does not create large buds and the total yield will be significantly reduced.

HARVESTING AND DRYING

Harvesting is the reaping of the bounty, and is the most enjoyable time you will spend with your garden.

Plants are harvested when the flowers are ripe. Generally, ripeness is defined as when the white pistils start to turn brown, orange, etc. and start to withdraw back into the false seed pod. The seed pods swell with resins usually reserved for seed production, and we have ripe sinse buds with red and golden hairs.

It is interesting that the time of harvest controls the "high" of the buds. If harvested "early" with only a few of the pistils turned color, the buds will have a more pure THC content and will have less THC that has turned to CBD and CBN's. The lessor psychoactive substances will create the bouquet of the pot, and control the amount of stoneyess and stupidity associated with the high. A pure THC content is very cerebral, while high THC, high CBD, CBN content will make the plants more of a stupid, or hazy buzz. Buds taken later, when fully ripened will normally have these higher CBN, CBD levels and may not be what you prefer once you try different samples picked at different times. Don't listen to the experts, decide yourself based on what you come to like yourself.

Keep in mind, a bud weighs more when fully ripe. It is what most growers like to sell, but take some buds early for yourself, every week until you harvest, and decide how you like it for yourself. Grow the rest to full maturity if you plan to sell it.

Most new growers want to pick early, because they are impatient. That's OK! Just take buds from the middle of the plant or the top. Allow the rest to keep maturing. Often, the tops of the plants will be ripe first. Harvest them and let the rest of the plant continue to ripen. You will notice the lower buds getting bigger and fuzzier as they come into full maturity. With more light available to the bottom portion of the plant now, the plant yields more this way over time, than taking a single harvest.

Use a magnifier and try to see the capitated stalked trichomes (little THC crystals on the buds). If they are mostly clear, not brown, the peak of floral bouquet is near. Once they are mostly all turning brownish in color, the THC levels are dropping and the flower is past optimum potency, declining with light and wind exposure rapidly.

Don't harvest too late! It's easy to be too careful and harvest late enough potency has declined. Watch the plants and learn to spot peak floral potency.

Do not cure pot in the sun, it reduces potency. Slow cure hanging buds upside down in a ventilated space. That is all that is needed to have great sensi. Drying in a paper bag works too, and may be much more convenient. Bud tastes great when slow dried over the course of a week or two.

If your in a hurry, it's OK to dry a small amount in-between paper sheets or a paper bag in a microwave oven. Go slow and check it, don't burn it. Use the defrost power setting for a slower, better drying. It will be harsh smoking this way though.

A food dehydrator or food preserver will dry your pot in a few hours, but it will not taste the same as slow-dried. Very close though. And this will speed your harvest time (which can be nerve-racking, with all this pot hanging around drying.)

Dry buds until the stems are brittle enough to snap, then cure them in a sealed tupperware container, burping air and turning the buds daily for two weeks.

Once experienced grower told me to dry in an uninsulated area of the house (like the garage) so that the temperature will rise and fall each night, as the plant is drying. If you treat the plant as if it were still alive, it will use some of it's chlorophyll while it is drying, and the smoke will be less harsh.

CLONING

Cloning is asexual reproduction. Cuttings are taken from a mother plant in vegetative growth, and rooted in hydroponic medium to be grown as a separate plant. The offspring will be plants that are identical to the parent plant.

Cloning preserves the character of your favorite plant. Cloning can make an ocean of green out of a single plant, so it is a powerful tool for growing large crops, and will fill a closet quickly with your favorite genetics. When you find the plant you want to be your "buddy" for the rest of your life, you can keep that plant's genetic character alive for decades and pass it on to your children's children. Propagate and share it with others, to keep a copy, should your own line die out. A clone can be taken from a clone at least 20 times, and probably more, so don't worry about myths of reduced vigor. Many reports indicate it's not a problem.

Cloning will open you to the risk of a fungus or pests wiping out the whole crop, so it's important to pick plants that exhibit great resistance to fungus and pests. Pick the plant you feel will be the most reliable to reproduce in large scale, based on health, growth rate, resistance to pests, and potency. The quality of the high, and the type of buzz you get will be a very important determining factor.

Take cuttings for clones before you move plants from vegetative grow area to the flowering area. Low branches are cut to increase air circulation under the green canopy. Rooted clones are moved to the vegetative growth area, and new clones are started in the cloning area using the low branch cuttings. Each cycle of growth will take from 4-8 weeks, so you can constantly be growing in 3 stages, and harvesting every 6-8 weeks.

Some types of plants are more difficult to clone than others. Big Bud is reported to not clone very well. One of my favorite plants, Mr. Kona, is the most amazing pot I ever smoked, but it is hard as hell to clone. What a challenge! I noticed other varieties that were rooting much quicker, but it was the stone I was after! Once you find the psychoactive, almost hallucinogenic properties of some Indica/Sativa hybrids, you never want to smoke a pure Indica again. Indica is however, great medicinally, so I like to grow a few pure strains too. If a plant is harvested, you can sample it, and decide if you want to clone it. Pick your favorite 2 or 3 distinctly different types of plants to clone, based on trying the harvested plants. The plants you want to clone can be regenerated by putting them in constant light. In a few weeks, you will have many vegetative cuttings available for cloning and preserving your favorite

plants. Always keep a mother plant in vegetative mode for any strain you want to keep alive. If you flower all your clones, you may end up killing off a strain if you don't have any plant devoted to being a mother. I killed off a sacred strain accidentally this way; my harvested plants failed to regenerate and the strain would have died completely had not previously given it to friends to grow it as well. I was in luck, and a buddy set me up with another clone of this strain to grow as a mother plant for a new crop of clones.

After two months, any marijuana plant can be cloned. Flowering plants can be cloned, but the procedure may take considerably longer. It's best to wait, and regenerate vegetatively plants that have been harvested. A single regenerated/harvested plant can generate hundreds of cuttings. Before taking cuttings, starve the plant for nitrogen for a week at least, so that the plant is not extremely green, as this will make rooting take longer. Take cuttings from the bottom 1/3 of the plant, when doing ordinary pruning. Cut young growth tips from a vegetative stage, mature plant 3-5 inches long with a stem diameter 1/5-1/10 inch. Cut with a sterile razor blade or X-acto knife (flamed) and immerse the cut end of the clone into a tub of distilled water mixed with 1/4 tspn Peters 5-50-17 per gallon. Next, cut the bottom .2 inch off the end while it is submerged, using a diagonal cut. Remove the clone from the tub and dip into a liquid cloning solution following instructions on the label. Dust with RootToneF and place in cloning tray or medium. Flowering plants can be cloned too, but may take longer, and may not have as high a success rate.

Cloning goes quickest with the liquid rooting solutions, in a warmed, aerated tray, with subdued lighting and high humidity. Placing cuttings into 1" rockwool cubes in a covered tray works great too. In a closet, you can make space above the grow area so that the heat of the lamp warms the tray (passive collecting) and spare the expense and hassle of the aquarium heater (\$24) or agricultural heating pad w/ thermostat (pricey). A double 4" fluorescent lamp will be perfect. Leave lamps on for 24 hours a day. Cuttings should root in 2-3 weeks.

I found only one liquid rooting hormone solution that was not over \$10. (Olivia's Gel was \$12 for a 1.6 ounce bottle. Geez, what is this stuff, gold?) I found some dipNgrow for \$9, considered myself lucky, and got a tray and clear cover for \$7. A clear tray cover or greenhouse enclosure is needed to bring up humidity to 90% (greenhouse levels). Liquid rooting hormone seems to be much more effective than powders. Some types available are Olivia's, Woods, and dipNgrow.

Mix a weak cloning solution of high P plant food (such as Peter's 5-50-17), trace elements, and epsom salts and then dip plants in rooting solution per instructions on label. All of the above nutrients should be added in extremely small amounts, 25% of what would normally be used on growing plants. Or use a premade solution such as Olivia's Rooting Solution. Corn syrup has been reported to supplement the sugars needed by the plant during cloning, since it consists of plant sugars.

Use a powder fungicide too, like RoottoneF to be sure you don't spoil the clones with fungus. This is important, since clones and fungus like the conditions you will be creating for good rooting:

mild light, 72-80 degrees, high humidity

In rockwool, there is no need for airtighting the solution, just keep the cubes in 1/4" of solution so they wick and stay moist at all times. Try to keep clones evenly spaced, and spray them with water once a day to keep them moist and fresh. Pull out clones if they are diseased and dying, to keep them away from healthy starts.

Another method is to float cuttings in a tray full of solution on polystyrene disposable plates, or styrene sheets (shipping/packing material) with holes punched, so the tops and leaves are out of the water. Take off all large leaves, leaving only smaller top leaves to reduce demand on the new rooting stalk. Aerate the tray solution with an air pump and bubble stone. Keep solution at 72-80 degrees for best results. Change the solution daily if not using an air stone and pump, so that oxygen is always available to the cuttings. A week later, clip yellowing leaves from cuttings to reduce water demands as the cuttings start to root.

Buy a tray with a clear cover made for rooting at an indoor gardening supply house. You must keep humidity very high for the clones. Put cuttings in an ice chest with cellophane over the top and a light shining down if you don't want to pay for the grow tray and cover.

It's also possible to directly place a dipped cutting in a moist block of floral foam with holes punched, or vermiculite in a cup; be sure to root cuttings in a constantly moist medium. Jiffy peat cubes are not recommended, as published reports indicate results were not good for rooting clones. Place starter cubes in tray of solution. Check twice a day to be sure cubes are moist, not drenched, and not dry. After about 2-3 weeks, rootlets will appear at the bottom of the pods. Transplant at this point to growing area, taking care not to disturb any exposed roots.

One grower writes us:

I have had virtually all attempted clones root with the following scheme:

0. Prep cutting by removing large leaves on tip to be cut, allow to heal.
1. While holding underwater, take final diagonal cut on stem to be rooted.
2. Dip in Rootone, then spear stem about 2" deep in 16 oz. cups of 1/2 vermiculite, 1/2 perlite, which are kept in a styrofoam cooler. 3. Spray cuttings with a VERY mild complete fert. soln.
4. Cover top of cooler with Saran Wrap, then punch holes for ventilation.
5. Keep cooler in relatively mild temps, low light, and spray cuttings daily.
6. Cuttings should root in about 3 weeks.

Cloning is not as easy as starting from seed. With seeds, you can have 18" tall plants in 6 weeks or less. With clones, it may take 6 weeks for the plant to sprout roots and new growth. Seeds are easily twice as fast if you have empty indoor space being wasted that needs to be put to use quickly. Always breed a few buds for seeds, even if you expect to be cloning most of the time, you could get wiped out, and have nothing but your seeds left to start over.

Cloning in rockwool seems to work great, and no airpump is needed. I paid \$9 for 98 rockwool starter cubes. A plastic tray is available (\$.95) that holds 77 cubes in pockets allowing the cubes to be held in a tray of nutrient solution. They are easily removed and placed in a larger rockwool growing cube when rooted.

BREEDING

It is possible to breed and select cuttings from plants that grow, flower, and mature faster. Some plants will naturally be better than others in this regard, and it is easy to select not only the most potent plants to clone or breed, but the fastest growing/flowering plants as well. Find your fastest growth plant, and breed it with your "best high" male for fast flowering, potent strains. Clone your fastest, best high plant for the quickest monocrop garden possible. Over time, it will save you a lot of waiting around for your plants to mature.

When a male is starting to flower (2-4 weeks before the females) it should be removed from the females so it does not pollinate them. It is taken to a separate area. Any place that gets just a few hours of light per day will be adequate, including close to a window in a separate room in the house. Put newspaper or glass under it to catch the pollen as the flowers drop it.

Keep a male alive indefinitely by bending it's top severely and putting it in mild shock that delays it's maturity. Or take the tops as they mature and put the branches in water, over a piece of plate glass. Shake the branches every morning to release pollen onto the glass and then scrap it with a razor blade to collect it. A male pruned in this fashion stays alive indefinitely and will continue to produce flowers if it gets suitable dark periods. This is much better than putting pollen in the freezer! Fresh pollen is always best.

Save pollen in an air tight bag in the freezer. It will be good for about a month. It may be several more weeks before the females are ready to pollinate. Put a paper towel in the bag with it to act as a desecant.

A plant is ready to pollinate 2 weeks after the clusters of female flowers first appear. If you pollinate too early, it may not work. Wait until the female flowers are well established, but still all while hairs are showing.

Turn off all fans. Use a paper bag to pollinate a branch of a female plant. Use different pollen from two males on separate branches. Wrap the bag around the branch and seal it at the opening to the branch. Shake the branch vigorously. Wet the paper bag after a few minutes with a sprayer and then carefully remove it. Large plastic zip-lock bags also. Slip the bag over

the male branch and shake the pollen loose. Carefully remove the bag and zip it up. It should be very dusty with pollen. To pollinate, place it over a single branch of the female, zipping it up sideways around the stem so no pollen leaks out. Shake the bag and the stem at the same time. Allow to settle for an hour or two and shake it again. Remove it a few hours later. Your branch is now well pollinated and should show signs of visible seed production in 2 weeks, with ripe seeds splitting the calyxes by 3-6 weeks. One pollinated branch can create hundreds of seeds, so it should not be necessary to pollinate more than one or two branches in many cases.

When crossing two different varieties, a third variety of plant will be created. If you know what characteristics you're looking for in a new strain, you will need several plants to choose from in order to have the best chance of finding all the qualities desired. Sometimes, if the two plants bred had dominant genes for certain characteristics, it will be impossible to get the plant you want from one single cross. In this case, it is necessary to interbreed two plants from the same batch of resultant seeds from the initial cross. In this fashion, recessive genes will become available, and the plant character you desire may only be possible in this manner. Usually, it is desirable only to cross two strains that are very different. In this manner, one usually arrives at what is referred to as "hybrid vigor". In other words, often the best strains are created by taking two very different strains and mating them. Less robust plants may be the result of interbreeding, since it opens up recessive gene traits that may lead to reduced potency. Hybrid offspring will all be very different from each other. Each plant grown from the same batch of seeds collected from the same plant, will be different. It is then necessary to try each plant separately and decide its individual merits for yourself. If you find one that seems to be head and shoulders above the rest in terms of early flowering, high yield and get buzz, that's the plant to clone and continue breeding.

In depth genetics is beyond the scope of this work. See Marijuana Botany; Smith, for more detailed info in this area.

SINSEMILLA

When the female plant is not allowed to pollinate, it grows full of resin that was intended to make seeds. False seed pods swell with THC laden resin and the pistils turn red and orange and withdraw into the pods. Then the plant is harvested.

Seeds are not part of the bud when the flowers mature. This is called Sinsemilla, and simply means "no seeds".

FEMINISED SEEDS

It is possible to cross your favorite two female plants to create a new strain of seeds that will produce all female plants. Preferably, these two plants will be different types of plants, not from the same mother's seeds.

This will create the best offspring, since it will not lead to inbreeding. It is easier to gauge the quality of female plants than male plants, since the smoke is more potent and easier to judge its finer qualities. Plants from seeds created in this fashion will be all female plants since there will be no chance of male chromosomes from female parents.

Use Gibberellic Acid on one branch of a female plant to induce male flowers. Gibberellic Acid is sold by nursery supply houses for plant breeding and hybridizing. Spray the plant once every day for 10 days with 100 ppm gibberellic acid. When the male flowers form, pollinate the flowers of your other target female plant you have selected. Just pollinate one branch unless you want lots of seeds!

Once the branch has male flowers, cut the branch and root it in water, with glass under it to catch the male pollen when it drops. Use a rooting solution similar to the above cloning solution. Collect the pollen with a plastic bag over the branch and shake it. Use a razor blade to scrap up fallen pollen and add it to the bag too.

It is also possible to pollinate the flowers of the plant you create the male flowers on, crossing it with itself. This is used to preserve a special plant's characteristics. Cloning will also

preserve the plants characteristics, but will not allow you to store seeds for use later. Crossing a plant with itself can lead to inbreeding problems, so it may not be the optimum solution in many cases.

I once tried using Gibberellic Acid, sprayed on a healthy female, every day for over a week. No male flowers appeared on the plant. Your milage may vary.

ODORS AND NEGATIVE IONS

Negative ion generators have been used for years now to cut down on odors in a grow room, but reports are coming in that a negative ion generator will increase growth speed and yield. No true evidence to support this, however it does make sense, due to the fact that people and animals seem to be altered in a positive way by negative ions in the air, so plants may "feel" better too. Try putting one in the grow room. You may notice the buds don't have as much scent when picked, but that may be desirable in some cases.

A negative ion generator can be purchased for \$15 to \$100 depending on the type and power involved. Some have reversed cycles that collect the dust to a charged plate. It is also possible to use grounded aluminum foil on the wall and shelf where the ionizer sits, to collect these particles. Just wipe the foil clean once a month. It should be grounded to an electrical outlets ground wire. If you don't cover the wall and shelf with paper or foil, the wall will turn dark with dust taken from the air, and you will have to repaint that wall later.

OXYGEN

O₂ to the roots is a big concern, since the plant requires this for nutrients to be available, and to rid itself of toxins, etc. One of the easiest things to do is use food grade hydrogen peroxide in the water to increase the availability of oxygen in the water. H₂O₂ has an extra oxygen atom that will easily break away and can be used by the plant. Oxygen Plus is a plant food that contains 25% hydrogen peroxide and is perfect for this use.

Using a planting medium that allows for plenty of aeration is also really important. Be sure you have good drainage by using Perlite, sand, or gravel in your mix and at the bottom of pots. Don't use a medium that holds too much water, or you may significantly reduce the oxygen available to the plant. More on that in the section on hydroponics.

Aerating the water before watering is also a good idea. In the case of soil potted plants, use an airpump to aerate the water overnight before watering your plants, or put the water in a container with a cap and shake it up real good before giving to the plants.

SAFETY AND PRIVACY

Utility companies can tell your bill is way off from the same time last year, and police are finding growers this way. More than 500 watts in the family home running constantly will show up as a regular monthly increase in electricity use. You can claim space heaters, more people living on the premises, too many television sets, and late hours, if they happen mention it to you (innocently). If the police knock and ask you about it, don't let them in, and move your plants to another location during the wee hours in a vehicle not your own.

Upon moving into a new place, it may be desirable to immediately establish high electricity use, so that your electrical use history won't reveal your activities in the future...

Light leaks, open windows, heat expelled from rooms that would normally be cool, and rip-offs are all serious issues to be concerned about. Don't use a burglar alarm on when your away from the house. People are busted this way when the kids try to rip off the garden and the police come. Lock the house up well, and let them take it if they need it so bad. It's not worth getting busted for a burglary...

Think ahead to any situation that will require outsiders to visit sensitive areas of the house. Repairmen, solicitors, meter readers, neighbors, appraisers, and pets should all be considered and contingency plans made in advance.

DISTILLED WATER

Some growers report purified or distilled water helps their plants grow faster. Perhaps due to sodium and heavy metals found in hard water that are not present in purified water. Hard water tends to build up alkaline salt deposits in soil that lockup trace minerals, and cause iron, copper and zinc deficiencies. There are several types of purified water, but many are not free of minerals that could be causing salt buildup over an extended period of time.

Tap water comes in two flavors. Hot and cold. The cold pipe has less calcium and sodium buildup in it, and should be freer of sediment once the water has been turned on and allowed to flow for 30 seconds. Hot water will have rust, lead deposits, and lots of sodium and calcium, so much so, you will see it easily. Use only the amount of hot water needed to make the water the correct temperature (70-80 F). Tap water filtered through a carbon (charcoal) filter will be free of chlorine and most large particles, but will still contain dissolved solids such as sodium and heavy metals (lead, arsenic, nickel, etc.).

Purified bottled water will be either Reverse Osmosis or some form of carbon/sediment filtered water. When purchasing water at a store, unless it says RO or Distilled, don't bother buying it. It could still have the same dissolved solids and heavy metals your tap water has.

BIRTH CONTROL PILLS

A solution of one pill to one gallon of water has been reported to cause increased growth speed in tomato plants. It is possible this will help herb plants too. One treatment administered before flowering and one administered a few weeks before harvesting might help the plant mature faster.

One grower told a story of the same type of plants, one administered the estrogen grew to 20 feet, while the other was 7 feet. This may be purely anecdotal, but it may work. Try it and report back to us on results.

SEED AND BUD STORAGE

Use a seal-a-meal to hermetically seal the bag with no air inside. Freeze or refrigerate, and bud and seed can be kept for years this way.

Rap seeds in a paper towel to absorb moisture. Keep them in the freezer, and pull out only as many seeds as you need, then pop them back in the freezer quickly.

A FINAL COMMENT

Good results can be had even in what appear to be rather marginal situations. (i.e.: a four inch pot in a room with a skylight.) With the minimum of: well drained medium, good light with ventilation, regular application of a complete fertilizer, pest control, and avoidance of detection, anyone can take a viable seed to maturity.

One need not have a lot of money, or even know-how to grow good plants.

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MARIJUANA

Marijuana is a deciduous plant which grows from seeds. The fibrous section of the plant was (has been replaced by synthetics) used to make rope. The flowering tops, leaves, seeds, and resin of the plant is used by just about everyone to get HIGH. Normally, the vegetable parts of the plant are smoked to produce this "high," but they can also be eaten. The active ingredient in marijuana resin is THC (tetrahydrocannabinol). Marijuana contains from 1 - 4 percent THC (4 per cent must be considered GOOD dope). Marijuana grows wild in many parts of the world, and is cultivated in Mexico, Vietnam, Africa, Nepal, India, South America, etc. The marijuana sold in the United States comes primarily from, yes, the United States. It is estimated that at least 50 per cent of the grass on the streets in America is homegrown. The next largest bunch comes across the border from Mexico, with smaller amounts filtering in from Panama, occasionally South America, and occasionally, Africa.

Hashish is the pure resin of the marijuana plant, which is scraped from the flowering tops of the plant and lumped together. Ganja is the ground-up tops of the finest plants. (It is also the name given to any sort of marijuana in Jamaica.) Marijuana will deteriorate in about two years if exposed to light, air or heat. It should always be stored in cool places. Grass prices in the United States are a direct reflection of the laws of supply and demand (and you thought that high school economics would never be useful). A series of large border busts, a short growing season, a bad crop, any number of things can drive the price of marijuana up. Demand still seems to be on the increase in the U.S., so prices seldom fall below last year's level. Each year, a small seasonal drought occurs, as last year's supply runs low, and next year's crop is not up yet. Prices usually increase about 20 - 75 per cent during this time and then fall back to "normal." Unquestionably, a large shortage of grass causes a percentage of smokers to turn to harder drugs instead. For this reason, no grass control program can ever be beneficial or "successful."

GROW IT!

There is one surefire way of avoiding high prices and the grass DT's: Grow your own. This is not as difficult as some "authorities" on the subject would make you believe. Marijuana is a weed, and a fairly vivacious one at that, and it will grow almost in spite of you.

OUTDOORS

Contrary to popular belief, grass grows well in many place on the North American continent. It will flourish even if the temperature does not raise above 75 degrees. The plants do need a minimum of eight hours of sunlight per day and should be planted in late April/early May, BUT DEFINITELY, after the last frost of the year. Growing an outdoor, or "au naturel", crop has been the favored method over the years, because grass seems to grow better without as much attention when in its natural habitat.

Of course, an outdoors setting requires special precautions not encountered with an indoors crop; you must be able to avoid detection, both from law enforcement freaks and common freaks, both of whom will take your weed and probably use it. Of course, one will also arrest you. You must also have access to the area to prepare the soil and harvest the crop. There are two schools of thought about starting the seeds. One says you should start the seedlings for about ten days in an indoor starter box (see the indoor section) and then transplant. The other theory is that you should just start them in the correct location. Fewer plants will come up with this method, but there is no shock of transplant to kill some of the seedlings halfway through. The soil should be prepared for the little devils by turning it over a couple of times and adding about one cup of hydrated lime per square yard of soil and a little bit (not too much, now) of good water soluble nitrogen fertilizer. The soil should now be watered several times and left to sit about one week. The plants should be planted at least three feet apart, getting too greedy and stacking them too close will result in stunted plants. The plants like some water during their growing season, BUT not too much. This is especially true around the roots, as too much water will rot the root system. Grass grows well in corn or hops, and these plants will help provide some camouflage. It does not grow well with rye, spinach, or pepper weed. It is probably a good idea to plant in many small, broken patches, as people tend to notice patterns.

GENERAL GROWING INFO

Both the male and the female plant will produce THC resin, although the male is not as strong as the female. In a good crop, the male will still be quite smokeable and should not be thrown away under any circumstances.

Marijuana can reach a height of twenty feet (or would you rather wish on a star) and obtain a diameter of 4 1/2 inches. If normal, it has a sex ratio of about 1:1, but this can be altered in several ways. The male plant dies in the 12th week of growing, the female will live another 3 - 5 weeks to produce her young ones. Females can weigh twice as much as males when they are mature. Marijuana soil should compact when you squeeze it, but should also break apart with a small pressure and absorb water well. A nice test for either indoor or outdoor growing is to add a bunch of worms to the soil, if they live and hang around, it is good soil, but if they don't, well, change it. Worms also help keep the soil loose enough for the plants to grow well.

SEEDS

To get good grass, you should start with the right seeds. A nice starting point is to save the seeds from the best batch you have consumed. The seeds should be virile, that is, they should not be grey and shriveled up, but green, meaty, and healthy appearing. A nice test is to drop the seeds on a hot frying pan. If they "CRACK," they are probably good for planting purposes. The seeds should be soaked in distilled water overnight before planting. BE SURE to plant in the ground with the pointy end UP. Plant about 1/2" deep. Healthy seeds will sprout in about five days.

SPROUTING

The best all around sprouting method is probably to make a sprouting box (as sold in nurseries) with a slated bottom or use paper cups with holes punched in the bottoms. The sprouting soil should be a mixture of humus, soil, and fine sand with a bit of organic fertilizer and water mixed in about one week before planting. When ready to transplant, you must be sure and leave a ball of soil around the roots of each plant. This whole ball is dropped into a baseball-sized hold in the permanent soil. If you are growing, transplanting indoors, you should use a green safe light (purchased at nurseries) during the transplanting operation. If you are transplanting outdoors, you should time it about two hours before sunset to avoid damage to the plant. Always wear cotton gloves when handling the young plants. After the plants are set in the hole, you should water them. It is also a good idea to use a commercial transplant chemical (also purchased at nurseries) to help them overcome the shock.

INDOOR GROWING

Indoor growing has many advantages, besides the apparent fact that it is much harder to have your crop "found," you can control the ambient conditions just exactly as you want them and get a guaranteed "good" plant. Plants grown indoors will not appear the same as their outdoor cousins. They will be scrawnier appearing with weak stems and may even require you to tie them to a growing post to remain upright, BUT THEY WILL HAVE AS MUCH OR MORE RESIN!

If growing in a room, you should put tar paper on the floors and then buy sterilized bags of soil from a nursery. You will need about one cubic foot of soil for each plant. The plants will need about 150 ml. of water per plant/per week. They will also need fresh air, so the room must be ventilated. However, the fresh air should contain NO TOBACCO smoke. At least eight hours of light a day must be provided. As you increase the light, the plants grow faster and show more females/less males. Sixteen hours of light per day seems to be the best combination, beyond this makes little or no appreciable difference in the plant quality. Another idea is to interrupt the night cycle with about one hour of light. This gives you more females. The walls of your growing room should be painted white or covered with aluminum foil to reflect the light. The lights themselves can be either bulbs or fluorescent. Figure about 75 watts per plant or one plant per two feet of fluorescent tube. The fluorescents are the best, but do not use "cool white" types. The light sources should be an average of twenty inches from the plant and NEVER closer than 14 inches. They may be mounted on a rack and moved every few days as the plants grow. The very best light sources are those made by Sylvania and others especially for growing plants (such as the "Gro-Lux" types).

HARVESTING AND DRYING

The male plants will be taller and have about five green or yellow sepals, which will split open to fertilize the female plant with pollen. The female plant is shorter and has a small pistillate flower, which really doesn't look like a flower at all but rather a small bunch of eaves in a cluster. If you don't want any seeds, just good dope, you should pick the males before they shed their pollen as the female will use some of her resin to make the seeds. After another three to five weeks, after the males are gone, the females will begin to wither and die (from loneliness?), this is the time to pick. In some nefarious Middle Eastern countries, farmers reportedly put their beehives next to fields of marijuana. The little devils collect the grass pollen for their honey, which is supposed to contain a fair dosage of THC. The honey is then enjoyed by conventional methods or made into ambrosia. If you want seeds - let the males shed his pollen then pick him. Let the female go another month and pick her. To cure the plants, they must be dried. On large crops, this is accomplished by constructing a drying box or drying room. You must have a heat source (such as an electric heater) which will make the box/room reach 130 degrees. The box/room must be ventilated to carry off the water-vapor-laden air and replace it with fresh. A good box can be constructed from an orange crate with fiberglass insulated walls, vents in the tops, and screen shelves to hold the leaves. There must be a baffle between the leaves and the heat source. A quick cure for smaller amounts is to: cut the plant at the soil level and wrap it in a cloth so as not to lose any leaves. Take out any seeds by hand and store. Place all the leaves on a cookie sheet or aluminum foil and put them in the middle shelf of the oven, which is set on "broil." In a few seconds, the leaves will smoke and curl up, stir them around and give it another ten seconds before you take them out.

TO INCREASE THE GOOD STUFF

There are several tricks to increase the number of females, and the THC content of plants: You can make the plants mature in 36 days if you are in a hurry, by cutting back on the light to about 14 hours, but the plants will not be as big. You should gradually shorten the light cycle until you reach fourteen hours. You can stop any watering as the plants begin to make the resin rise to the flowers. This will increase the resin a bit. You can use a sunlamp on the plants as they begin to develop flower stalks. You can snip off the flower, right at the spot where it joins the plant, and a new flower will form in a couple of weeks. This can be repeated two or three times to get several times more flowers than usual. If the plants are sprayed with Ethrel early in their growing stage, they will produce almost all female plants. This usually speeds up the flowering. It may happen in as little as two weeks. You can employ a growth changer called colchicine. This is a bit hard to get and expensive. (Should be ordered through a lab of some sort and it costs about \$35 a gram.) To use the colchicine, you should prepare your presoaking solution of distilled water with about 0.10 per cent colchicine. This will cause many of the seeds to die and not germinate, but the ones that do come up will be polyploid plants. This is the accepted difference between such strains as "gold" and normal grass, and yours will DEFINITELY be superweed. The problem here is that colchicine is a poison in larger quantities and may be poisonous in the first generation of plants. Bill Frake, author of the CONNOISSEUR'S HANDBOOK OF MARIJUANA runs a very complete colchicine treatment down and warns against smoking the first generation plants (all succeeding generations will also be polyploid) because of this poisonous quality. However, the Medical Index shows colchicine being given in very small quantities to people for treatment of various ailments. Although these quantities are small, they would appear to be larger than any you could receive from smoking a seed-treated plant. It would be a good idea to buy a copy of CONNOISSEUR'S, if you are planning to attempt this, and read Mr. Drake's complete instructions. Another still-experimental process to increase the resin is to pinch off the leaf tips as soon as they appear from the time the plant is in the seedling stage on through its entire life-span. This produces a distorted, wrecked-looking plant which would be very difficult to recognize as marijuana. Of course, there is less substance to this plant, but such wrecked creatures have been known to produce so much resin that it crystallizes a strong hash all over the surface of the plant. It might be wise to try it on a plant or two and see what happens.

PLANT PROBLEM CHART

Always check the overall environmental conditions prior to passing judgment - soil around 7 pH or slightly less - plenty of water, light, fresh air, loose soil, no water standing in pools.

SYMPTOM

PROBABLE PROBLEM - CURE

Larger leaves turning yellow - smaller leaves still green.

Nitrogen deficiency – add nitrate of soda or organic fertilizer.

Older leaves will curl at edges, turn dark, possibly with a purple cast.

Phosphorus deficiency - add commercial phosphate.

Mature leaves develop a yellowish cast to least venial areas.

Magnesium deficiency - add commercial fertilizer with a magnesium content.

Mature leaves turn yellow and then become spotted with edge areas turning dark grey.

Potassium deficiency - add muriate of potash.

Cracked stems, no healthy support tissue.

Boron deficiency – add any plant food containing boron.

Small wrinkled leaves with yellowish vein systems.

Zinc deficiency – add commercial plant food containing zinc.

Young leaves become deformed, molybdenum possibly yellowing.

Molybdenum deficiency - use any plant food with a bit of in it.

BAD WEED/GOOD WEED

Can you turn bad weed into good weed? Surprisingly enough, the answer to this oft-asked inquiry is, yes! Like most other things in life, the amount of good you are going to do relates directly to how much effort you are going to put into it. There are no instant, supermarket products which you can spray on Kansas catnip and have wonder weed, but there are a number of simplified, inexpensive processes (Gee, Mr. Wizard!) this will enhance mediocre grass somewhat, and there are a couple of fairly involved processes which will do up even almost-parsley weed into something worth writing home about.

EASES

1. Place the dope in a container which allows air to enter in a restricted fashion (such as a can with nail holes punched in its lid) and add a bunch of dry ice, and the place the whole shebang in the freezer for a few days. This process will add a certain amount of potency to the product. However, this only works with dry ice, if you use normal, everyday freezer ice, you will end up with a soggy mess...
2. Take a quantity of grass and dampen it, place in a baggie or another socially acceptable container, and store it in a dark, dampish place for a couple of weeks (burying it also seems to work). The grass will develop a mold which tastes a bit harsh, and burns a tiny bit funny, but does increase the potency.
3. Expose the grass to the high intensity light of a sunlamp for a full day or so. Personally, I don't feel that this is worth the effort, but if you just spent \$400 of your friend's money for this brick of super-Colombian, right-from-the-President's-personal-stash, and it turns out to be Missouri weed, and you're packing your bags to leave town before the people arrive for their shares, well, you might at least try it. It can't hurt.
4. Take the undesirable portions of our stash (stems, seeds, weak weed, worms, etc.) and place them in a covered pot, with enough rubbing alcohol to cover everything. Now CAREFULLY boil the mixture on an ELECTRIC stove or lab burner. DO NOT USE GAS - the alcohol is too flammable. After 45 minutes of heat, remove the pot and strain the solids out, SAVING THE ALCOHOL. Now, repeat the process with the same residuals, but fresh alcohol. When the second boil is over, remove the solids again, combine the two

quantities of alcohol and boil until you have a syrupy mixture. Now, this syrupy mixture will contain much of the THC formerly hidden in the stems and such. One simply takes this syrup and thoroughly combine it with the grass that one wishes to improve upon.

MARYGIN

Marygin is an anagram of the words marijuana and gin, as in Eli Whitney. It is a plastic tumbler which acts much like a commercial cotton gin. One takes about one ounce of an herb and break it up. This is then placed in the Marygin and the protruding knob is rotated. This action turns the internal wheel, which separates the grass from the debris (seeds and stems). It does not pulverize the grass as screens have a habit of doing and is easily washable. Marygin is available from: P.O. Box 5827 Tuscon, Arizona 85703 (\$5)

Yummy Marijuana Recipes

Acapulco Green

- 3 ripe avocados
- 1/2 cup chopped onions
- 2 teaspoons chili powder
- 3 tablespoons wine vinegar
- 1/2 cup chopped marijuana (grass)

Mix the vinegar, grass and chili powder together and let the mixture stand for one hour. Then add avocados and onions and mash it all together. It can be served with tacos or as a dip.

Pot Soup

- 1 can condensed beef broth
- 3 tablespoons grass
- 3 tablespoons lemon juice
- 1/2 can water
- 3 tablespoons chopped watercress

Combine all ingredients in a saucepan and bring to a boil over medium heat. Place in the refrigerator for two to three hours, reheat, and serve.

Pork and Beans and Pot

- 1 large can (1 lb. 13 oz.) pork and beans
- 1/2 cup grass
- 4 slices bacon
- 1/2 cup light molasses
- 1/2 teaspoon hickory salt
- 3 pineapple rings

Mix everything together in a casserole, cover top with pineapple and bacon, bake at 350 degrees for about 45 minutes. Serves about six.

The Meat Ball

- 1 lb. hamburger
- 1/4 cup chopped onions
- 1 can cream of mushroom soup
- 1/4 cup bread crumbs
- 3 tablespoons grass
- 3 tablespoons India relish

Mix it all up and shape into meat balls. Brown in a frying pan and drain. Place in a casserole with soup and 1/2 cup water, cover and cook over low heat for about 30 minutes. Serves about four.

Spaghetti Sauce

- 1 can (6 oz.) tomato paste
- 2 tablespoons olive oil
- 1/2 cup chopped onions
- 1/2 cup chopped grass
- 1 pinch pepper
- 1 can (6 oz.) water
- 1/2 clove minced garlic
- 1 bay leaf
- 1 pinch thyme
- 1/2 teaspoon salt

Mix in large pot, cover and simmer with frequent stirring for two hours. Serve over spaghetti.

Pot Loaf

- 1 packet onion soup mix
- 1 (16 oz.) can whole peeled tomatoes
- 1/2 cup chopped grass
- 2 lbs. ground beef or chicken or turkey
- 1 egg
- 4 slices bread, crumbled

Mix all ingredients and shape into a loaf. Bake for one hour in 400-degree oven. Serves about six.

Chili Bean Pot

- 2 lbs. pinto beans
- 1 lb. bacon, cut into two-inch sections
- 2 cups red wine
- 4 tablespoons chili powder
- 1/2 clove garlic
- 1 cup chopped grass
- 1/2 cup mushrooms

Soak beans overnight in water. In a large pot pour boiling water over beans and simmer for at least an hour, adding more water to keep beans covered. Now add all other ingredients and continue to simmer for another three hours. Salt to taste. Serves about ten.

Bird Stuffing

- 5 cups rye bread crumbs
- 2 tablespoons poultry seasoning
- 1/2 cup each of raisins and almonds
- 1/2 cup celery
- 1/3 cup chopped onions
- 3 tablespoons melted butter
- 1/2 cup chopped grass
- 2 tablespoons red wine

Mix it all together, and then stuff it in.

Apple Pot

- 4 apples (cored)
- 1/2 cup brown sugar
- 1/4 cup water
- 4 cherries
- 1/3 cup chopped grass
- 2 tablespoons cinnamon

Powder the grass in a blender, then mix grass with sugar and water. Stuff the apple cores with this paste. Sprinkle apples with cinnamon, and top with a cherry. Bake for 25 minutes at 350 degrees.

Sesame Seed Cookies

- 3 oz. ground roast sesame seeds
- 3 tablespoons ground almonds
- 1/4 teaspoon nutmeg
- 1/4 cup honey
- 1/2 teaspoon ground ginger
- 1/4 teaspoon cinnamon
- 1/4 oz. grass

Toast the grass until slightly brown and then crush it in a mortar. Mix crushed grass with all the other ingredients, in a skillet. Place skillet over low flame and add 1 tablespoon of salt butter. Allow it to cook. When cool, roll mixture into little balls and dip them into the sesame seeds.

Pot Brownies

- 1/2 cup flour
- 3 tablespoons shortening
- 2 tablespoons honey
- 1 egg (beaten)
- 1 tablespoon water
- 1/2 cup grass
- pinch of salt
- 1/4 teaspoon baking powder
- 1/2 cup sugar
- 2 tablespoons corn syrup
- 1 square melted chocolate
- 1 teaspoon vanilla
- 1/2 cup chopped nuts

Sift the flour, baking powder, and salt together. Mix shortening, sugar, honey, syrup, and egg. Then blend in the chocolate and the other ingredients, and mix well. Spread in an 8-inch pan and bake for 20 minutes at 350 degrees.

Banana Bread

- 1/2 cup shortening
- 2 eggs
- 1 teaspoon lemon juice
- 3 teaspoons baking powder
- 1 cup sugar
- 1 cup mashed bananas
- 2 cups sifted flour
- 1/2 cup chopped grass
- 1/2 teaspoon salt
- 1 cup chopped nuts

Mix the shortening and sugar, beat eggs, and add to mixture. Separately mix bananas with lemon juice and add to the first mixture. Sift flour, salt, and baking powder together first, then mix all the ingredients together. Bake for 1 1/4 hours at 375 degrees.

Au Naturel

If you happen to be in the country at a place where pot is being grown, this is one of the greatest recipes you can try. Pick a medium-sized leaf off of the marihuana plant and dip it into a cup of drawn butter, add salt, and eat it.

The Joys of an Herb Garden at Home; v.3

REMEMBER, it's up to you to inform your friends, family, neighbours and co-workers that we have been lied-to, cheated, relieved of freedoms, happiness, privacy, civil rights and liberties by the WOD.

Hemp prohibition is a political issue driven by big business interests and it's damn well time we turn these policies around through extreme civil-disobedience. Grow it everywhere, they can't get it all...

Hemp laws are immoral.

Hemp can save the forests, the planet and us.

Prohibition laws create crime and black markets.

Taxing drugs would pay for treatment of addicts.

350,000 people die every year from smoking tobacco.

150,000 people die every year from drinking alcohol.

0 people die every year from smoking pot.

Cannabis could potentially save .5 million lives every year in the US alone.

The CIA is the worlds' biggest cocaine dealer.

The CIA would rather you smoke crack than pot.

The War on Drugs is a campaign of fear and mind control; a war on civil liberties.

Stop political prison sentences in our time.

Stop the promotion of poisons and the prohibition of medicines.

Stop the lies.

Tell the truth.

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OVERVIEW

There are few things in life as good as your own herb, grown by yourself at home out in the garden and indoors in pots... Oregano, Dill, Basil, Sage and other herbs are all easy to grow. Mint will take over the whole yard if you let it. Fresh mint and celantro are incredible in salads and oriental dishes. But it all comes down to a truly motivational herb that is your friend and mine, a great healer and teacher to those that know it well.

Most people think of gardens as a seasonal, yearly project, but it's actually less time consuming and more rewarding to keep the garden going year round. If one were to attempt to grow year round, indoor gardening techniques will be needed at least during winter to keep the garden producing. You will have herb fresh at all times, there is no worry of mass storage through the winter and spring, it requires less space, and once established, requires only minimal attention every week to keep it producing at optimal levels.

The best part of being a gardener is it connects you to the earth. It connects you with nature, and is spiritually enriching. Try giving your plants energy by beaming good thoughts and energy at them every time you visit them. I find this helps me as much as it helps them; my plants seem to respond to it favourably.

GENETICS AND THE PLANT

It's very important to start with good genetics. You should attempt to find seeds from local gardeners that are acclimated and bred for local climate and best floral characteristics. Potency, aroma, fast growth, early maturation, resistance to fungus and pests. All of these factors are considered by the seasoned gardener and you will benefit enormously by finding a friend to get you started on the journey that never ends...

Attempt to find an Indica/Sativa hybrid if possible, as this will have the best high and good characteristics for indoor growth as well. Indica plants have a heavy, stony high that is tiresome, and sativas' are hard to grow indoors due to high light requirements, and late flowering traits, so a hybrid can be bred that will have the energetic, cerebral high of the sativa and the early maturation tendencies of the Indica plant.

The Indica plant is easily recognized by its extremely broad leaves that are very rounded on the sides. The Sativa has very narrow, finger-like leaves. A hybrid will have qualities of both and have leaves that are a cross of these two types, thinner than an Indica, but much broader than a Sativa. It is possible to recognize a good hybrid by the leaves once you know what to look for.

Look for seeds that are dark brown or light grey. Some may have dark lines inset into these colours, like tiger stripes. White, small seeds are immature and should not be planted.

INDOORS & OUTDOORS - CONSTANT HARVEST STRATEGY

One of the best solutions to energy verses output for most home gardeners is to use outdoor light for flowering and use continuous light indoors for germination and vegetative growth. This will take advantage of the natural light/dark cycle and cut your energy use in half compared to the same operation indoors. A small greenhouse can be built of Filon fibreglass or PVC sheets that is innocuous and looks much like a storage shed or tool shed so it's not likely to raise suspicions.

In fact, a large shed of metal or plywood can be modified with a luminous roof of PVC, glass, fibreglass or plastic sheet, and some strains that do not require a great deal of light will grow well. Such a shed will discourage fly-by sightings and keep your business your own! It also allows you to keep out rats and gophers, keeps out the neighbour kids, and can be easily locked up. It will also give you an opportunity to actually plant in the ground if you desire, and this is the best way to avoid root-bound plants (if your not using hydroponics), and get bigger harvests.

In winter, indoor space is used to start new seedlings or cuttings to be placed outside in the spring, using natural sunlight to ripen the plants. This routine will provide at least 3 outdoor/greenhouse harvests per year. If more space is available to constantly be starting indoors and flowering 2nd harvest plants outdoors, harvests are possible every 60 days in many areas, with a small indoor harvest in the winter as a possibility as well.

The basic strategy of year round production is to understand the plant has two growth cycles. At germination the plant enters into a vegetative state and will be able to use all the continuous light you can give it. This means there is no dark cycle required. The plant will photosynthesis constantly and grow faster than it would outdoors with long evenings. Photosynthesis stops during dark periods and the plant uses sugars produced to build during the evening. This is not a

requirement and the plant will grow faster at this stage with continuous photosynthesis (constant light).

Once the plant is 12-18" tall, weather permitting, it can be forced to start flowering by placing it outside in the Spring or Fall. (For Summer outdoor flowering, the night must be artificially lengthened in the greenhouse to "force" the plants to flower. See FLOWERING chapter.) Moving the plants to 10-13 hour light periods (moving it outside) with uninterrupted darkness (no bright lights nearby) will force the plant to flower. It will ripen and be 2-3' when ready to harvest. When a plant is moved from continuous indoor light to a 10-13 hour day outside, it will start to flower in anticipation of oncoming winter. Vegetative starts moved outside March 1st, will be ripe by May 1. Vegetative starts moved outside on May 1 will be ripe by July 1. Starts moved outside Sept 1 are picked by Nov. 1st. In Winter, operations are moved indoors and a crop is planted for seed in anticipation of planting outdoors the next summer, or just for some extra winter stash.

Keep in mind that the "man" is looking for plants in the Sept./Oct./Nov. time-frame, and may never notice plants placed outside to flower in April. Be smart, make your big harvest in May, not October!

PLANTING INDOORS

A small indoor space should be found that can be used to germinate seeds; these vegetative starts are placed outside to mature in the spring after last freezes are over. The space can be a closet, a section of a bedroom, a basement area, an attic or unused bathroom. Some people devote entire bedrooms to growing.

The space must be light leak proofed, so that no suspicious light is seen from outside the house. This could invite fuzz or rip-offs.

The space should be vented. Opening the door of a closet can be enough ventilation if the space is not lit by big lights that generate a lot of heat. Separate exhaust and incoming air vents are best. One at the top of the room to exhaust air into the attic or out the roof, and one to bring in air from an outside wall or under-floor crawl space. Use fans from old computer cabinets, available from electronic liquidators for \$5 each. Dimmer switches can be used to regulate the speed/noise of the fans. Use silicon to secure the fans to 4-6" PVC pipe pushed through a round hole cut in the floor and ceilings. Use lots of silicon to damp the fans vibrations, so that the walls do not resonate to the fans' oscillations.

Line the walls with aluminum foil, dull side out to diffuse the light and prevent hot-spots, or paint the walls bright white to reflect light. Aluminized mylar, 1 mil thick is best. (\$20 for 25 feet of a 4' wide roll.) Mirrors are not good to use, since the glass eats light!

Line the floor with plastic in case of water spills, etc. Set up a voltage interrupt socket and be sure the electrical wiring will handle the lamps you going to use. Always place ballasts for HID lamps on a shelf, so they are above floor level, in case of water spills. Spacers placed on the floor under a ballast will work too.

A shelf above the main grow area can be used to clone cuttings and germinate seedlings. It will allow you to double the area of your grow space and is an invaluable storage area for plant food, spray bottles and other gardening supplies. This area stays very warm, and no germination warming pad will be needed, so this arrangement saves you \$.

Hang a light proof curtain to separate this shelf from the main area when used for flowering. This will allow constant lights on the shelf and dark periods in the main grow area. Velcro can be used to keep the curtain in place and ties can be used to roll it up when tending the garden. Black vinyl with white backing works best.

Now you need light. A couple of shop lights will be fine if you just want to start plants inside and then take them outside to grow in a small greenhouse. They can be purchased with bulbs for about \$10 each, or without bulbs for around \$8. Try to find them on sale. Use one Cool White and one Warm Light type bulb in each to get the best light spectrum possible for plant growth. Do not use expensive Grow Lux type bulbs, as they do not put out as much light, and therefore do not work as well in most situations (go figure). If Cool White is all you can find, or afford, use them. They work fine, and are by far the cheapest. (About \$1-2 each.)

SHELF GROWING

Shelf gardening with fluorescents may be the trend of the future, since the materials are so inexpensive, and easy to obtain. Fluorescent lamps are great for shelf gardening. In this system, many shelves can be placed, one above the other, and fluorescent lamps are used on each shelf. Some shelves have 24 hour lighting, some have 12 hour lighting (for flowering). Two areas are best, perhaps with one other devoted to cloning and germination of seed.

Shelf gardening assumes your going to keep all plants 3' or shorter at maturity, so all shelves are 3-4 feet apart. Less light is necessary when you have plants that are this short and forced to mature early.

One drawback to a shelf garden like this is that it is very time consuming to adjust the lamp height every day, and it is harder to take a vacation for even a week with no tending of the garden. This applies mostly to the vegetative stage, when plants are growing as much as an inch per day. Lamps on the flowering shelves are not adjusted nearly as often.

Normally, the lamps should be kept within 2 inches of the tops of the plants, with the plants arranged such that they get progressively taller as the end of the lamps go up, so that all plants are within this 2" range. This is an ideal however, and if you do go on vacation, adjust the lamps so that your sure the plants will not be able to grow up to the lamps within that length of time. If enough flourecents are used to completely saturate the shelf with light, the spacing issue will not create spindly plants. They will nearly grow a little slower if the lamps are not very close to them.

An alternative is to use fluorescent lamps for cloning, germination and early seedling growth on the top shelf of a closet, then switch over to HPS for heavy vegetative growth and/or flowering in the main closet area.

Position the HPS such that it won't need adjustment, at the top most possible point in the closet or room. Most HPS installations will not require lamp height adjustment. Just attach the lamp to the underside of shelf or ceiling as high as possible, and if you want to get a few plants closer to it, put them on a temporary shelf, box or table to get them closer to the lamp.

A shelf is all that is necessary with this type of setup, preferably at least 18" wide, up to about 24" maximum. This area must be painted a very bright white, or covered with aluminum foil, dull side out to reflect light back to the plants. (Dull side out prevents hot-spots; diffuses light better.) Paint the shelf white too. Or, use aluminized mylar, a space blanket, or any silvery surface material. Do not use mirrors, as the glass soaks up light.

Hang shop lamps from chains and make sure you can adjust them with hooks or some other type of mechanism so they can be kept as close to the plants as possible at all times (1-2"). If the lamps are too far from the plants, the plants could grow long, spindly stems trying to reach the lamp, and will not produce as much bud at maturity. This is due to internode length being much longer. This is the length of stem between each set of leaves. If it is shorter, there can be more internodes, thus more branches, thus a plant that provides more buds in less space at harvest time.

Shelf gardening is sometimes referred to as Sea of Green, because many plants are grown close together, creating a green canopy of tops that are grown and matured quickly, and the next crop is started and growing concurrently in a separate area of continuous light. Clones are raised in a constant light shelf, until they start to grow well vegetatively, then placed on a 12 hour per day shelf to flower.

LIGHT

Indoors, 2000 lumens per sq. ft. is about as low as you want to go indoors. If you get under this mark, plant growth will certainly not go as fast as possible, and internode/stem length will increase. Also, light distance to plants will be much more critical. Daily adjustments to the lamps will be necessary, meaning you get no vacations.

2500 lumens psf should be a good target, and 3000 is optimal if your going to inject or enrich CO2 levels (more on that later).

High Intensity Discharge lamps are the best solution for most indoor growers. HID lamps come in 3 basic flavours: High Pressure Sodium (HPS), Metal Halide (MH) and Mercury Vapor. Metal Halide is an improved spectrum, higher intensity Mercury Vapour design. HPS is a yellowish sort of light, maybe a bit pink or orange. Same as some street lamps.

HPS lamps can be used to grow a crop from start to finish. Tests show that the HPS crop will mature 1 week later than a similar crop under MH, but it will be a bigger yield, so it's better to wait the extra week.

The easiest HID to buy, and least expensive initially are the fluorescent and mercury vapour lamps. MV will put out about 8000 lumens per 175 watts, and 150 watts of HPS puts out

about 15k lumens, so HPS is almost twice as efficient. But the colour spectrum from MV lamp output is not as good. HPS is high in reds, which works well for flowering, while the Metal Halide is rich in blues, needed for the best vegetative growth. Unfortunately, MV lamps provide the worst spectrum for plant growth, but are very inexpensive to purchase. They are not recommended, unless you find them free, and even then, the electricity/efficiency issues outweigh the initial costs saved.

400 watt HPS will output around 45k lumens. For every 500 watts of continuous use, you use about \$20 a month in electricity, so it is evident that a lamp taking half the power to output the same lumens (or twice the lumens at the same power level) will pay for itself in a year or so, and from then on, continuous savings will be reaped. This is a simple initial cost vs. operating costs calculation, and does not take into account the faster growth and increased yield the HPS lamp will give you, due to more light being available. If this is factored into the calculation the HPS lamp will pay for itself with the first crop, when compared to MV or fluorescent lamps, since it is easily twice as efficient and grows flowers faster and bigger.

Lamp Type	Watts	Lumens per bulb	Total efficiency
Fluorescent Bulb	40	3 000	400 watts = 30k lumens
Mercury Vapour	175	8 000	400 watts = 20k lumens
Metal Halide	400	36 000	400 watts = 36k lumens
High P. Sodium	400	45 000	400 watts = 45k lumens

Notice the Mercury Vapour lamps are less efficient than the fluorescent (FL), and can not be positioned as close to the plants, so the plants will not be able to use as much of the MV light. The light distribution is not as good either. MV lamps simply are not suitable for indoor gardening. Use fluorescent, MH, or HPS lamps only. Halogen arc lamps generate too much heat and not very much light for the wattage they use, and are also not recommended, even though the light spectrum is suitable for decent growth.

There is a new type of HPS lamp called Son Agro, and it is available in a 250, 1000, and 400 watt range. The 400 is actually 430 watts; they have added 30 watts of blue to this bulb. It is a very bright lamp (53k lumens) and is made for greenhouse use. These bulbs can be purchased to replace normal HPS bulbs, so they are an option if you already own a HPS lamp. The beauty of this bulb is that you do not give up most of the advantages of MH lamps, such as minimal internode spacing and early maturation, like most HPS users do, and you have all advantages of a HPS lamp. One bulb does it all.

Internodal length of plants grown with the Son Agro are the shortest ever seen with any type of lamp. Plants grown under this lamp are incredibly bushy, compact and grow very fast. Son Agro bulbs however, do not last as long as normal HPS bulbs. There is something like a 25% difference in bulb life.

Metal Halide (MH) is another option, and is available in both a 36k and 40k lumen bulbs for the 400 watt size. The Super Bulb (40k) is about \$10-15 more, and provides an extra 4000 lumens. I think the Super Bulb may last longer; if so, that makes it the way to go. Halide light is more blue and better than straight HPS for vegetative growth, but is much less efficient than HPS. It is possible to purchase conversion bulbs for a MH lamp that convert it to HPS, but the cost of the conversion bulb is more expensive than the colour corrected Son Agro bulb, so I would recommend just buying the Son Agro HPS. Even though it costs more initially, you get more for your energy dollar later, and it's much easier to hang than 10 fluorescent tubes.

If you have a MH 36k lumen lamp burning at 400 watts and a 53k lumen HPS burning at 430 watts, which is better efficiency wise? Which will provide a better yield? Obviously, the Son Agro HPS, but of course, the initial cost is higher. Actually, the ballast will add about 10% to these wattage numbers.

The Son Agro bulb will prove much better than the MH for any purpose. The MH bulb does not last as long, but is cheaper. Compare \$36 for a 400 watt MH bulb vs. \$40 for the HPS bulb. Add \$15 for the Son Agro HPS. The HPS bulb life is twice as long. 10k hours vs. 21k hours. The Son Agro is 16k hours or so. Still, longer bulb life and more light add up to more for your energy dollar long term.

Horizontal mounting of any HID is a good idea, as this will boost by 30% the amount of light that actually reaches the plants. Most HID's sold for indoor garden use these days are of this horizontal mounting arrangement.

HPS is much less expensive to operate than any other type of lamp, but comes in the 70 watt size at the home improvement stores. This size is not very efficient, but blows away FL in efficiency, so they might be an alternative to FL for very small operations, like 9 sq. feet or less. Over 9 sq. feet, you need more light than one of these lamps can provide, but you could use two of them. 70 watt HPS lamps cost about \$40 each, complete. Two lamps would be 140 watts putting out about 12k lumens, so it's better than FL, but a 150 watt HPS puts out about 18k lumens, the bulb life is longer, bulbs are cheaper and the lamp more efficient to operate. The biggest problem is that the mid size lamps like the 150 and 250 watt HPS are almost as expensive to buy as the larger 400's. For this reason, if you have room for the larger lamp, buy the 400. If your going pro, a 1080 watt model is available too, but you might find there is better light distribution from two 400's rather than one large lamp. Of course, the two smaller lamps are more expensive to purchase than one large lamp, so most people choose the larger lamp for bigger operations.

Heat build up in the room is a factor with HID lamps, and just how much light the plants can use is determined by temperature, CO2 levels, nutrient availability, PH, and other factors. Too big of a lamp for a space will make constant venting necessary, and then there is no way to enrich CO2, since it's getting blown out of the room right away.

Bulb Costs: the bulb cost on the 70 watt HPS is \$24, the 150 is only \$30, and the 400 is only \$40. So you will spend more to replace two 70 watt bulbs than you will to replace one 400 watt HPS. (Go figure.) Add that up with the lower resale value on the 70's (practically nothing)

and the fact that they are being modified and are not suited to this application, and it becomes evident that \$189 for a 250 HPS lamp, or \$219 for a 400, might just be worth the price. Keep in mind that for \$30 more, you can have the larger lamp (400watt) and it puts out 20k lumens more light than the smaller lamp. Not a bad deal!

Here is the breakdown on prices (from memory):

Type	Complete Cost	Bulb Cost	Bulb Life	Lumens
HPS 400	\$219	\$40	18k hours	50k
MH 400	\$175	\$37	10k hours	36k
Son Argo400	\$235	\$55	15k hours	53k
Super Mh400	\$190	\$45	??	40k
MH 250	\$149	\$32	??	21k
HPS 250	\$165	\$36	??	27k
HPS argo250	\$180	\$53	??	30k
MH 150	\$139	\$25	??	14k
HPS 175	\$150	\$30	??	17k

If your looking for these types of lamps, look in the Yellow Pages under gardening, nurseries, and lighting for indoor gardening stores in your area.

SEA OF GREEN

Sea of Green (SOG) is the theory of harvesting lots of small plants, matured early to get the fastest production of buds available. Instead of growing a few plants for a longer period of time, in the same space many smaller plants are grown that mature faster and in less time. Thus, less time is required between crops. This is important to you when the electricity bill comes each month. One crop can be started while another is maturing, and a continuous harvest, year round can be maintained. 4 plants per square foot will be a good start for seedlings. 1 plant per square foot will allow plenty of room for each plant to grow a large top cola, but will not allow for much bottom branching. This is OK since indoors, these bottom branches are always shaded anyway, and will not grow very well unless given additional light and space. The indoor grower quickly realizes that plants that are too tall do not produce enough at the bottom to make the extra growing time used worth while. An exception to this rule would be if it is intended the plants are to go outside at some point, and it is expected that the light/shading issue will not be a factor at that point.

The plants, if started at the same time, should create what is called a "green canopy" that traps most of the light at the top level of the plants. Little light will penetrate below this level, since the plants are so close together. The gardener is attempting to concentrate on the top of the

plant, and use the light and space to the best advantage, in as little time as possible. Use of nylon poultry fence or similar trellising laid out over the green canopy will support the plants as they start to droop under.

the weight of heavy fruiting tops. Stakes can be used too, but are not as easy to install for plants in the middle and back of the room, where reach is more difficult.

It's easy to want big plants, since they will produce more yield per plant, but it's usually better with limited space to grow smaller plants that mature faster and pack into smaller spaces. Sea of Green was developed in Holland. Instead of fitting 4 large plants in that small room, fit 12 small ones on a shelf above 12 other small plants. These plants take only 3-4 months to mature from germination to ripe buds, and harvesting takes place constantly, since there is both a vegetative and flowering area devoted to each, with harvests every 45-60 days.

It's not the size of the plant, but the maturity and quality of the product that counts. Twice as many plants grown half as big will fill the grow space twice as fast, so harvests take place almost twice as often. Get good at picking early flowering plants, and propagate only those that are of the best quality.

6" square containers will allow for 4 plants per square foot. You may also gauge by the size of your growing tray (for passive hydroponics); I like kitty litter boxes. (\$3 each at Target) Planted 4 per square foot, (for vegetative seedlings) a 12 sq. ft. closet will hold 48 seedlings on one shelf. In my case, I use 4" rockwool cubes that fit into kitty litter pans @ 12 cubes per pan. I can get 5 pans onto a 12 sq. ft. closet upper shelf, so that is 60 seedlings on one small shelf!

For flowering indoors, 1 plant per sq. ft. is a good rule of thumb for SOG. If less plants are grown in this size space, it will take them longer to fill the space, thus more electricity and time will be used to create the same amount of product. If more than one plant p.s.f. is attempted, the grower will soon find that plants thus crowded tend to be more stem than bud, and the total harvest may be reduced, so be cautious.

It's good to avoid "topping" your plants if you want them to grow as fast as possible. It's better just to grow 2 or 4 times more plants, since they will produce more, faster, in the same space. Also, "training" plants with twist-ties is a great way to get them to bush out a bit. Just take any type of plastic or paper twist tie and wrap it around the top of the plant, then pull it over until the top is bent over 90-180 degrees and then attach this to the main stem lower on the plant. Do this for one week and then release the plant from it's bond. The plant can be trained in this fashion to take less vertical space and to grow bushier, to fill the grow space and force lower limbs to grow upward and join the green canopy. This technique takes advantage of the fact that if the top is pulled over, it creates a hormonal condition in the plant that makes it bush out at all lower internodes.

Sea of Green entails growing to harvest the main cola (top) of the plant. Bottom branches are trimmed to increase air flow under the "blanket" of growing tops. Use these cuttings for clones, as they are the easiest part of the plant to root. It's also the fastest part of the plant to regenerate after flowering has occurred.

GERMINATION

Germinate seeds in sterile soil (for planting outdoors) or a hydroponic medium of rockwool or vermiculite. DO NOT (!) use a Jiffy cube #7 to germinate seeds. Informal tests and experience show these peat cubes do not work well and stunt the plants growth. Planting in vermiculite gives the seedling so much oxygen, and are so easy for roots to grow in, that the plants look large 1 week after germination!

Keep them moist at all times, by placing seeds in vermiculite filled 16oz cups with holes in the bottom, placed in a tray of weak nutrient solution, high in P. Rockwool cubes also work extremely well. When the seed sprouts, place the rockwool cubes into larger rockwool cubes. No repotting or transplanting, and no soil mixing!

You can germinate seeds in a paper towel. This method is tricky; it's easy to ruin roots if they dry out, or are planted too late after germinating. Paper towels dry out REAL FAST! Place paper towel in a bowl, saturated with weak nutrient solution (not too much!), and cover with plastic wrap to keep it from drying out. Put bowl in a warm area; top of the gas stove, water heater closet, or above warm lamps. Cover with black paper to keep out light. Check every 12 hours and plant germinated seeds with the grow tip up (if possible) in a growing medium as soon as the root coming out of the seed is 1/16" or longer. Use tweezers, and don't touch the root tip.

Transplant as little as possible by germinating in the same container you intend to grow the plant in for a significant period of time. Just plant in vermiculite or rockwool. You will be amazed at the results! 90% germination is common with this method, as compared to 50% or less with Jiffy Cubes. (Your mileage may vary.)

5-55-17 plant food such as Peter's Professional will stimulate root growth of the germinating seed and the new seedlings. Use a very dilute solution, in distilled water, about 1/3 normal strength, and keep temperatures between 72-80 degrees. Warm temperatures are very important. Many growers experience low germination rate if the temperatures are out of this range. A heating pad set to low or medium may be necessary, or a shelf constantly warmed by a light may do, but test it with a few seeds first, before devoting next years crop to it. No light is necessary and may slow germination. Cover germinating seeds with black paper to keep out light. Place seedlings in the light once they sprout.

Plan on transplanting only once or twice before harvest. Use the biggest containers possible for the space and number of seedlings you plan to start. Plants will suffer if continuously transplanted and delay harvesting. You will suffer too, from too much work! 13 2-litre plastic soda bottles filled with vermiculite/pearlite will fit in a cat box tray, and will not require transplanting for the first harvest, if you intend to grow hydroponically. Transplant them for a second regenerated harvest.

Cut holes in the bottom of containers and fill the last few inches at the top with vermiculite only, to start seeds or accept seedling transplants. Since vermiculite holds water well, wicks water well, but does not hold too much water, roots always have lots of oxygen,

even if they are sitting in a tray full of water. A hydrogen peroxide based plant food is used to get extra oxygen to the plants when the pans are kept continuously full. The water can be allowed to recede each time after watering, before new solution is added. This allows the plants roots to dry somewhat, and make sure they are getting enough oxygen.

Use SuperSoil brand potting soil, as it is excellent and sterilized. If you insist on using dirt from the yard, sterilize it in the microwave or oven until it gets steamy.(NOT RECOMMENDED) Sterilize the containers with a bleach solution, especially if they have been used a previous season for another plant.

VEGETATIVE GROWTH

Once sprouted, the plant starts vegetative growth. This means the plant will be photosynthesizing as much as possible to grow tall and start many grow tips at each pair of leaves. A grow tip is the part that can be cloned or propagated asexually. They are located at the top of the plant, and every major internode. If you "top" the plant, it then has two grow tips at the top. If you top each of these, you will have 4 grow tips at the top of the plant. (Since it takes time for the plant to heal and recover from the trauma of being pruned, it faster to grow 4 smaller plants and not top them at all. Or grow 2 plants, and "train" them to fill the same space. Most growers find)

All plants have a vegetative stage where they are growing as fast as possible after the plant first germinates from seed. It is possible to grow plants with no dark period, and increase the speed at which they grow by 15-30%. Plants can be grown vegetatively indefinitely. It is up to the gardener to decide when to force the plant to flower. A plant can grow from 12" to 12' before being forced to flower, so there is a lot of latitude here for each gardener to manage the garden based on goals and space available.

A solution of 20-20-20 with trace minerals is used for both hydroponic and soil gardening when growing continuously under lights. Miracle Grow Patio or RapidGrow plant food is good for this. A high P plant food such as Peter's 5-50-17 food is used for blooming and fruiting plants when beginning 12 hour days. Epsom salts (1tsp) should be used in the solution for magnesium and sulphur minerals. Trace minerals are needed too, if your food does not include them. Miracle Grow Patio includes these trace elements, and is highly recommended.

Keep lights on continuously for sprouts, since they require no darkness period like older plants. You will not need a timer unless you want to keep the lamps off during a certain time each day. Try to light the plants for 18 or more hours, or continuously at this point.

Bend a young plant's stem back and forth to force it to be very thick and strong. Spindly stems can not support heavy flowering growth. An internal oscillating fan will reduce humidity on the leave's stomata and improve the stem strength as well. The importance of neutral air circulation can not be stressed enough. It will exercise the plants and make them grow stronger, while reducing many hazards that could ruin your crop.

HYDROPONIC VEGETATIVE SOLUTION, per gallon:

Miracle Grow Patio (contains trace elements)

1 teaspoon

Epsom salts	1/2 teaspoon
Human Urine (OPTIONAL - may create odours indoors.)	1/4 cup
Oxygen Plus Plant Food (OPTIONAL)	1 teaspoon

This mixture will insure your plants are getting all major and minor nutrients in solution, and will also be treating your plants with oxygen for good root growth, and potassium nitrate for good burning qualities. Another good GROWTH PHASE mix is 1/4 tsp Peter's 20/20/20 fertilizer per gallon of water, with trace elements and oxygen added, or fish emulsion. Fish emulsion is great in the green-house or outdoors, where smells are not an issue, but is not recommended for indoors, due to its strong odour.

FLOWERING

The plant will be induced to fruit or flower with dark cycles of 11-13 hours that simulate the oncoming winter in the fall as the days grow shorter. As a consequence, it works out well indoors to have two separate areas; one that is used for the initial vegetative state and one that is used for flowering and fruiting. There is no other requirement other than to keep the dark cycle for flowering very dark with no light interruptions, as this can stall flowering by days or weeks.

Once a plant is big enough to mature (12" or over), dark periods are required for most plants to flower and bear fruit. This will require putting the lamp on a timer, to create regular and strict dark periods of uninterrupted light. In the greenhouse, the same effect can be created in the Summer (long days) by covering it with a blanket to make longer night periods. A strict schedule of covering the plants at 8pm and uncovering them at 8am for 2 weeks will start your plants to flowering. After the first 2 weeks, the schedule can be relaxed a little, but it will still be necessary to continue this routine for the plants to completely flower without reverting back to vegetative growth.

Outdoors, Spring and Fall, the nights are sufficiently long to induce flowering at all times. Merely bring the plants from indoors to the outside at these times, and the plants will flower naturally. In late Summer, with Fall approaching, it may be necessary only to force flowering the first two weeks, then the rapidly lengthening nights will do the rest.

Give flowering plants high P plant food and keep them on a strict light regimen of 12 hours, with no light, or no more than a full moon during the dark cycle. 13 hours light, 11 dark may increase flower size while still allowing the plant to go into the flowering mode. Use longer dark periods to speed maturity toward the end of the flowering cycle if speed is of the essence. (8-10 days) This will however, reduce total yield.

Two shelves can be used, one identical to the other, if strictly indoor gardening is desired. One shelf's lights are set for 12-13 hours, and one is lit continuously. Plants are started in continuous light, and are moved to the other shelf to flower to maturity after several weeks. This flowering shelf should be bigger than the "starting" or "vegetative" shelf, so that it can accommodate larger plants. Or, some plants can be taken outside if there is not enough space on the flowering shelf for all of them near harvesting.

A light tight curtain can be made from black vinyl, or other opaque material, with a reflective material on the other side to reflect light back to the plants. This curtain can be tied with cord when rolled up to work on the garden, and can be velcrowed down in place to make sure no light leaks in or out. If the shelf is placed up high, it will not be very noticeable, and will fit in any room. Visitors will never notice it unless you point it out to them, since it is above eye level, and no light is being emitted from it.

Flowering plants like very high P level foods, such as 5-50-17, but 10-20-10 should be adequate. Nutrients should be provided with each watering when first flowering.

Trace elements are necessary too; try to find foods that include these, so you don't have to use a separate trace element food too. Home improvement centres sell trace element solutions rich in iron for lawn deficiencies, and these can be adapted for use in cultivating the herb. Prices for these mass produced fertilizers are significantly cheaper than the specialized hydroponic fertilizers sold in indoor gardening shops, and seem to work just fine.

HYDROPONIC FLOWERING SOLUTION, per gallon:

- 1 tspn high P plant food, such as 15-30-15, or 5-50-17, etc.
- 1/2 tspn epsom salts
- 1 tspn Oxygen Plus Plant Food (Optional)
- 1 tspn Trace Element food

I cannot stress enough that during the FLOWERING PHASE, the dark period should not be violated by normal light. It delays flower development due to hormones in the plant that react to light. If you must work on the plants during this time, allow only as much light as a VERY pale moon can provide for less than 5 minutes. Keep pruning to a minimum during the entire FLOWERING PHASE.

A green light can be used to work on the garden during the dark period with no negative reactions from the plants. These are sold as nursery safety lights, but any green bulb should be OK. It is best to keep the dark hours a time when you would normally not wish to visit the garden. Personally, I like my garden lit from 7pm to 7am, since it allows me to visit the garden at night after work and in the morning before work, and all day long, while I'm too busy to worry about it, it lies unlit and undisturbed, flowering away...

Flowering plants should not be sprayed often as this will promote mould and rot. Keep humidity levels down indoors when flowering, as this is the most delicate time for the plants in this regard.

Early flowering is noticed 1-2 weeks after turning back the lights to 12 hour days. Look for 2 white hairs emerging from a small bulbous area at every internode. This is the easiest way to verify females early on. You can not tell a male from a female by height, or bushiness.

3-6 weeks after turning back the lights, your plants will be covered with these white pistils emerging from every grow tip on the plant. It will literally be covered with them. These

are the mature flowers, as they continue to grow and cover the plant. Some plants will do this indefinitely until the lights are turned back yet again. At the point you feel your ready to see the existing flowers become ripe (you feel the plant has enough flowers), turn the lights back to 8-10 hours. Now the plant will start to ripen quickly, and should be ready to harvest in 2-3 weeks. The alternative, is to allow the plant to ripen with whatever natural day length is available outside, or keep the plants on a constant 12 hour regimen for the entire flowering process, which may increase yield, but takes longer.

Plants can be flowered in the final stages outdoors, even if the days are too long for normal flowering to occur. Once the plant has almost reached peak floral development, it is too far gone to revert quickly to vegetative growth, and final flowering will occur regardless. This will free up precious indoor space sooner, for the next batch of clones to be flowered.

Look for the white hairs to turn red, orange or brown, and the false seed pods (you did pull the males, right?) to swell with resins. When most of the pistils have turned colour (~80%), the flowers are ripe to harvest.

Don't touch those buds! Touch only the large fan leaves if you want to inspect the buds, as the THC will come off on your fingers and reduce the overall yield if mishandled.

HYDROPONICS

Most growers report that a hydroponic system will grow plants faster than a soil medium, given the same genetics and environmental conditions. This may be due to closer attention and more control of nutrients, and more access to oxygen. The plants can breath easier, and therefor, take less time to grow. One report has it that plants started in soil matured after hydroponic plants started 2 weeks later!

Fast growth allows for earlier maturation and shorter total growing time per crop. Also, with soil mixtures, plant growth tends to slow when the plants become root-bound. Hydroponics provides even, rapid growth with no pauses for transplant shock and eliminates the labour/materials of repotting if rockwool is used. (Highly recommended!)

By far the easiest hydroponic systems to use are the wick and reservoir systems. These are referred to as Passive Hydroponic methods, because they require no water distribution system on an active scale (pump, drain, flow meter and path). The basis of these systems is that water will wick to where you want it if the medium and conditions are correct.

The wick system is more involved than the reservoir system, since the wicks must be cut and placed in the pots, correct holes must be cut in the pots, and a spacer must be created to place the plants up above the water reservoir below. This can be as simple as two buckets, one fit inside the other, or a kiddie pool with bricks in it that the pots rest on, elevating them out of the nutrient solution.

I find the wick setup to be more work than the reservoir system. Initial setup is a pain with wicks, and the plants sit higher in the room, taking up precious vertical space. The base the

pot sits on may not be very stable compared to a reservoir system, and a knocked over plant will never be the same as an untouched plant, due to stress and shock in recovery.

The reservoir system needs only a good medium suited to the task, and a pan to sit a pot in. If rockwool slabs are used, a half slab of 12" rockwool fits perfectly into a kitty litter pan. The roots spread out in very desirable horizontal fashion and have a lot of room to grow. Plants grown in this manner are very robust because they get a great deal of oxygen at the roots. Plants grown with reservoir hydroponics grow at about the same rate as wicks or other active hydroponic methods, with much less effort required, since it is by far the simplest of hydroponic methods. Plants can be watered and feed by merely pouring solution into the reservoir every few days. The pans take up very little vertical space and are easy to handle and move around.

In a traditional hydroponic method, pots are filled with lava/ vermiculite mix of 4 to 1. Dolite Lime is added, one Tblspn. per gallon of growing medium. This medium will wick and store water, but has excellent drainage and air storage capacity as well. It is however, not very reusable, as it is difficult to recapture and sterilize after harvest. Use small size lava, 3/8" pea size, and rinse the dust off it, over and over, until most of it is gone. Wet the vermiculite (dangerous dry, wear a mask) and mix into pots. Square pots hold more than round. Vermiculite will settle to bottom after repeated watering from the top, so only water from the top occasionally to leach any mineral deposits, and put more vermiculite on the top than the bottom. Punch holes in the bottom of the pots, and add water to the pan. It will be wicked up to the roots and the plants will have all they need to flourish.

The reservoir is filled with 1 1/2 - 3 inches of water and allowed to recede between waterings. When possible, use less solution and water more often, to pull more oxygen to the roots faster over time. If you go away on vacation, simply fill the reservoirs full to the top, and the plants will be watered for 2 weeks at least.

One really great hydroponic medium is Oasis floral foam. Stick lots of holes into it to open it up a little, and start plants/clones in it, moving the cube of foam to rockwool later for larger growth stages. Many prefer floral foam, as it is inert, and adds no PH factors. It's expensive though, and tends to crumble easily. I'm also not sure it's very reusable, but it seems to be a popular item at the indoor gardening centres.

Planting can be made easier with hydroponic mediums that require little setup such as rockwool. Rockwool cubes can be reused several times, and are premade to use for hydroponics. Some advantages of rockwool are that it is impossible to over water and there is no transplanting. Just place the plant's cube on top of a larger rockwool cube and enjoy your extra leisure time.

Some find it best to save money by not buying rockwool and spending time planting in soil or hydroponic mediums such as vermiculite/lava mix. Perlite is nice, since it is so light. Perlite can be used instead of or in addition to lava, which must be rinsed and is much heavier.

But rockwool has many advantages that are not appreciated until you spend hours repotting; take a second look. It is not very expensive, and it is reusable. It's more stable than

floral foam, which crunches and powders easily. Rockwool holds 10 times more water than soil, yet is impossible to over-water, because it always retains a high percentage of air. Best of all, there is no transplanting; just place a starter cube into a rockwool grow cube, and when the plant gets very large, place that cube on a rockwool slab. Since rockwool is easily reused over and over, the cost is divided by 3 or 4 crops, and ends up costing no more than vermiculite and lava, which is much more difficult to reclaim, sterilize and reuse (repot) when compared to rockwool. Vermiculite is also very dangerous when dry, and ends up getting in the carpet and into the air when you touch it (even wet), since it dries on the fingers and becomes airborne. For this reason, I do not recommend vermiculite indoors.

Rockwool's disadvantages are relatively few. It is alkaline PH, so you must use something in the nutrient solution to make it acidic (5.5) so that it brings the rockwool down from 7.7, to 6.5 (vinegar works great.) And it is irritating to the skin when dry, but is not a problem when wet.

To pre-treat rockwool for planting, soak it in a solution of fish emulsion, trace mineral solution and phosphoric acid (PH Down) for 24 hours, then rinse. This will decrease the need for PH worries later on, as it buffers the rockwool PH to be fairly neutral.

Hydroponics should be used indoors or in greenhouses to speed the growth of plants, so you have more bud in less time. Hydroponics allows you to water the plants daily, and this will speed growth. The main difference between hydroponics and soil growing is that the hydroponic soil or "medium" is made to hold moisture, but drain well, so that there are no over-watering problems associated with continuous watering. Also, hydroponically grown plants do not derive nutrients from soil, but from the solution used to water the plants. Hydroponics reduces worries about mineral build up in soil, and lack of oxygen to suffocating roots, so leaching is usually not necessary with hydroponics.

Hydroponics allows you to use smaller containers for the same given size plant, when compared to growing in soil. A 3/4 gallon pot can easily take a small hydroponically grown plant to maturity. This would be difficult to do in soil, since nutrients are soon used up and roots become cut-off from oxygen as they become root-bound in soil. This problem does not seem to occur nearly as quickly for hydroponic plants, since the roots can still take up nutrients from the constant solution feedings, and the medium passes on oxygen much more readily when the roots become bound in the small container.

Plant food is administered with most waterings, and allows the gardener to strictly control what nutrients are available to the plants at the different stages of plant growth. Watering can be automated to some degree with simple and cheap drip system apparatus, so take advantage of this when possible.

Hydroponics will hasten growing time, so it takes less time to harvest after planting. It makes sense to use simple passive hydroponic techniques when possible. Hydroponics may not be desirable if your growing outdoors, unless you have a greenhouse.

CAUTION: it is necessary keep close watch of plants to be sure they are never allowed to dry too much when growing hydroponically, or roots will be damaged. If you will not be able to tend to the garden every day, be sure the pans are filled enough to last until next time you return, or you can easily lose your crop.

More traditional hydroponic methods (active) are not discussed here. I don't see any point in making it more difficult than it needs to be. It is necessary to change the solution every month if your circulating it with a pump, but the reservoir system does away with this problem. Just rinse the medium once a month or so to prevent salts build up by watering from the top of the pot or rockwool cube with pure water. Change plant foods often to avoid deficiencies in the plants. I recommend using 2 different plant foods for each phase of growth, or 4 foods total, to lessen chances of any type of deficiency.

Change the solution more often if you notice the PH is going down quickly (too acid). Due to cationic exchange, solution will tend to get too acid over time, and this will cause nutrients to become unavailable to the plants. Check PH of the medium every time you water to be sure no PH issues are occurring.

Algae will tend to grow on the medium with higher humidities in hydroponics. It will turn a slab of rockwool dark green. To prevent this, use the plastic cover the rockwool came in to cover rockwool slab tops, with holes cut for the plants to stick out of it. It's easy to cut a packaged slab of rockwool into two pieces, then cut the end of the plastic off each piece. You now have two pieces of slab, each covered with plastic except on the very ends. Now cut 2 or 3 4" square holes in the top to place cubes on it, and place each piece in a clean litter pan. Now your ready to treat the rockwool as described above in anticipation of planting.

If growing in pots, a layer of gravel at the top of a pot may help reduce algae growth, since it will dry very quickly. Algae is merely messy and unsightly; it will not actually cause any complications with the plants.

RECYCLING

Use pots made from squarish containers such as plastic water jugs, etc. More plants will fit in less space and have more rooting area if square containers are used. This makes your garden a recycling centre, and saves you tons of money.

2-litre soda bottles work great, but are not square. 13 will fit in a kitty litter box, and these will take a 3 foot plant to maturity hydroponically. If you can get 4 litter boxes in a closet, you can grow 52 plants like this vegetatively. Spread them out more for flowering.

Old buckets, plastic 3-5 gallon containers (food and paint industries, try painters' and restaurant dumpsters), paper paint buckets, old plastic garbage cans of all sizes, and garbage bags have all been used successfully by growers.

Do not use paper milk cartons and juice cartons for reservoir hydroponics, since these are difficult to sterilize, and they introduce fungus into your reservoir trays. Inert materials, such as plastic is best.

Be sure to sterilize all containers before each planting with a chlorine bleach solution of 2 tspn. of bleach to one gallon of water. Let container and medium such as rockwool soak for several hours in the solution before rinsing thoroughly.

PLANTING OUTDOORS

Outdoor growing is the best. Outdoor pot by far is the strongest, since it gets more light, it's naturally more robust. No light leak problems. No dark periods that keep you out of your grow room. No electricity bills. Sunlight tends to reach more of the plant, if your growing in the direct sun. Unlike growing indoors, the bottom of the plant will be almost as developed as the top.

Outdoors, outside of a greenhouse, there are many factors that can kill your crop. Deer will try to eat them. Chipmunks and rodents too. Bugs will inhabit them, and the wind and rain can whip your little buds to pieces if they are exposed to strong storms. For this reason, indoor pot can be better than outdoor, but the best smoke I ever tasted was outdoor pot, so that tells you something; nothing beats the sun.

Put up a fence and make sure it stays up. Visit your plot at least once every two weeks, and preferably more often if water needs demand.

It's a good idea to use soil if you don't have a green house, since hydroponics will be less reliable outside in the open air, due mostly to evaporation.

Light exposure is all important when locating a site for a greenhouse or outdoor plot. A backyard grower will need to know where the sun shines for the longest period; privacy and other factors will enter in as well. Try to find an innocuous spot that gets full winter sun from mid morning to mid afternoon, at least from 10-4, preferably 8-5. This will be really asking for a lot if you live north of 30 degrees latitude since days are short in winter. Since most gardeners will not want to use the greenhouse in the middle of the winter, you can still use winter sun as an indicator of good spring and fall lighting exposures. Usually the south side of a hill gets the most sun. Also, large areas open to the sun on the north side of the property will get good southern exposures. East and West exposures can be good if they get the full morning/afternoon sun and mid-day sun as well. Some books say the plants respond better to morning-only sun, verses afternoon-only sun, so if you have to choose between the two, morning sun may be better.

Disguise your greenhouse as a tool shed, or similar structure, by using only one wall and a roof of white opaqued plastic, PVC, Filon, or glass, and using a similar coloured material for the rest of the shed, or painting it white or silvery, to look like metal. Try to make it appear as if it has always been there, with plants and trees that grow around it and mask it from view while allowing sun to reach it.

Filon (corrugated fibreglass) or PVC plastic sheets can be used outside to cover young plants grown together in a garden. Buy the clear greenhouse sheets, and opaque them with white wash (made from lime) or epoxy resin tinted white or grey and painted on in a thin layer. This will pass more sun than white PVC or Filon, and still hide the plants. Epoxy resin coats will

preserve the Filon for many more seasons than it would otherwise last. It will also allow you to disguise the shed as metal, if you paint the clear filon sheets with a thin layer of resin tinted light grey. Paint will work as well, but may not protect as much. Be careful to use only as much as needed, to reduce sun blockage to a minimum.

Dig a big hole, don't depend on the plant to be able to penetrate the clay and rubble unless your sure of the quality of topsoil in the area. Grassy fields would have good top soil, but your back yard may not. This alone can make the difference between an average 5' tall plant, and a 10' monster by harvest time. Growing in the ground will always beat a pot, since the plant will never become root bound in the ground. Plants grown in the ground should grow much larger, but will need more space for each plant, so plan accordingly, you can't move them once their in!

You may want to keep outdoor plants in pots so they can be easily moved. A big hole will allow the pot to be place in it, thus reducing the height of the plant, if fence level is an issue. Many growers find pots have saved a crop that had to be moved for some unexpected reason (repairman, appraiser, fire, etc.).

It's always best to put a roof over your plants outdoors. When I was a lad, we had plants growing over the fence line in the back yard. We started to build a greenhouse roof for them, and a cop saw us hauling wood, thought we were stealing it (which we were not) and looked over the fence at us and our lovely plants. We were busted, because he saw them. If he had seen a shed roof instead, there would never have been a problem. Moral of the Story: build the roof BEFORE the plants are sticking over the fence! Or train them to stay well below it. Live and learn...

When growing away from the house, in the wild, water is the biggest determining factor, after security. Water must be close by, or close to the soil surface, or you will have to pack water in. Water is heavy and this is very hard work. Try to find an area close to a source of water if possible, and keep a bucket nearby to carry water to your plot.

A novel idea in this regard is to find high water in the mountains, at altitude, and then route it down to a lower spot close by. It is possible to create water pressure in a hose this way, and route it to a drip system that feeds water to your plants continuously. Take a 5 gallon gas can, and punch small holes in it. Run a hose out of the main orifice and secure it somehow. Bury the can in a river or stream under rocks, so that it is hidden and submerged. Bury the hose coming out of it, and run it down hill to your garden area. A little engineering can save you a lot of work, and this rig can be used year after year.

GUERRILLA FARMING

Guerrilla farming refers to farming away from your own property, or in a remote location of your property where people seldom roam around. It is possible to find locations that for one reason or another are not easily accessible or are privately owned.

Try to grow off your property, on adjacent property, so that if your plot is found, it will not be traceable back to you. If it's not on your property, nobody has witnessed you there, and

there is no physical evidence of your presence (footprints, fingerprints, trails, hair, etc.), then it is virtually impossible to prosecute you for it, even if the cops think they know who it belongs to.

Never admit to growing, to anyone. Your best defence is that you're just passing through the area, and noticed something you decided to take a look at, or carry a fishing pole or binoculars and claim fishing or bird watching.

Never tell anyone but a partner where the plants are located. Do not bring visitors to see them, unless it is harvest time, and the plants will be pulled the same or following day.

Make sure your plants are out of sight. Take a different route to get to them if they are not in a secure part of your property, and cover the trail to make it look as if there is no trail. Make cut backs in the trail, so that people on the main trail will tend to miss the cut-back to the grow area. Don't park on the main road, always find a place to park that will not arouse suspicion by people that pass on the road. Have a safe house in the area if you are not planting close to home. Always have a good reason for being in the area and have the necessary items to make your claim believable.

Briar and poison oak patches are perfect if you can cut through it. Poison Oak must be washed away before an allergic reaction takes place. Teknu is a special soap solution that will deactivate poison oak before it has time to create a reaction. Apply Teknu immediately after contact and take a shower 30 mins. later.

Try to plant under trees, next to bushes and keep only a few plants in any one spot. Train or top the plants to grow sideways, or do something to prevent the classic Christmas tree look of most plants left to grow untrained. Tying the top down to the ground will make the plant branches grow up toward the sun, and increase yield, given a long enough growing season. Plants can be grown under trees if the sun comes in at an angle and lights the area for several hours every day. Plants should get at least 5 hours of direct sun every day, and 5 more hours of indirect light. Use shoes that you can dispose of later and cover your foot prints. Use surgical gloves and leave no fingerprints on pots and other items that might ID you to the fuzz...in case your plot is discovered by passers by.

Put up a fence, or the chipmunks, squirrels and deer will nibble on your babies until there is nothing left. Green wire mesh and nylon chicken fencing net work great and can be wrapped around trees to create a strong barrier. Always check it and repair every visit you make to the garden. A barrier of fishing line, one at 18" and another at 3' will keep most deer away from your crop.

Gopher Granola is available for areas such as the N. CA mountains, where wood rats and gophers will eat your crop if given any opportunity to do so. The best fence in the world will not keep rats away from your plants! Do not use soap to keep deer away, it will attract rats! (The fat in the soap is edible for them.) Put the poison grain in a feeder that only small rodents can enter, so that birds and deer can't eat it. Set out poison early, before actual planting. The rats must eat the grain for several days before it will have any effect on them. Ultimately, you may find it's

easier to grow in a greenhouse shed in your own backyard rather than try to keep the rats from eating your outdoor plot.

When growing away from the house, in the wild, water is the biggest determining factor, after security. The amount you can grow is directly proportional to the water available. If you must pack-in water, carry it in a backpack in case your seen in-route to your garden; you will appear to be merely a hiker, not a grower.

Transporting vegetative starts to the growing area is a most tricky aspect of growing outdoors. Usually, you will want to start plant indoors, or outside in your garden, then transport them to the grow site once they are firmly established. It may be desirable to first detect and separate males from females so that no effort of transporting/transplanting/watering males is incurred.

One suggestion is to use 3" rockwool cubes to start seedlings in, then put 20 of them in a litter pan, cover it with another pan, and transport this to the grow site. The cubes can be planted directly into soil. If spotted enroute to the grow area, burying a dead cat may be a good excuse for being in the area. Few people would demand to see the rotting corpse!

One outdoor grower we know has given up on seeds. He has several strains he likes to clone, so he starts 200 clones in his closet, then transports them outdoors in boxes to the grow site. No males, no differentiation, no weeding, no germinating seeds, no genetic uncertainties, no crops grown for seed, no transporting/transplanting/watering plants your just going to pull up later, no pollination nightmares, no wasted effort!

SOIL GROWING

Use Super Soil brand in California, as this is the only known soil on the West Coast that is guaranteed to be good. Many other brands are mostly wood products and have very few nutrients, are too moist, etc. Add vermiculite, perlite or sand to Super Soil to increase it's drainage and aeration.

Organic gardeners use their own compost prepared from a mixture of chicken, cow or other manure and household food waste, leaves, lawn clippings, dog hair and other waste products including urine, which is high in nitrogen. Dog hair is not recommended for guerilla gardeners planting off their property where police could find it. DNA tests could prove it was YOUR dog's hair!

Use P4 water crystals in the soil to give the plants a few days worth of emergency water reserves. This substance swells up with water and holds it like a sponge, so that roots will have a reserve if harsh drought makes constant watering necessary. Go real easy on this stuff though, it tends to sink to the bottom of the pot and suffocate bottom roots (new growth roots) and stunts the plant. Use in extreme moderation, let it swell up for at least an hour before mixing with other soil.

Plant size in soil is directly related to pot size. If you want the plant to grow bigger, put it in a bigger pot. Usually, ½ gallon per foot of plant is sufficient. A six foot plant would require a

minimum of a 3 gallon pot. Remember, square containers have more volume in a square space (like a closet).

Planting in the ground is always preferable when growing in soil. The plants can then grow to any size, unlimited by pot size.

Bat Guano, chicken manure, or worm castings can all be used to fertilize organically in soil. Manures can burn, so they should be composted with the soil first, before planting, over several weeks. Sea weed is available to provide a rich trace mineral source that breaks down slowly and constantly feeds the plants.

If growing outdoors in available soil, look around for leaves and other natural sources of nitrogen and work them into the soil, along with some dolomite lime and composted organic fertilizer. Even small amounts of plant food such as Miracle Grow can be added to soil at this time. (Organic gardeners frown upon this practice, however. Toxic wastes are produced by commercial fertilizer production.) Mulch can be made from leaves and spread out over the garden area to hold in moisture and keep down weeds near the plants.

SUBTERFUGE

Its interesting that pot plants really do blend in with other plants to the point that they are unidentifiable by all but the most observant. I remember a relative of the family on a visit to Texas showed me his corn in the garden and I was standing 3' away from several pot plants before I recognized them for what they were.

Plants started outdoors late in the season never get very big and never attract the least bit of attention when placed next to plants of similar or taller stature. Even tall plants grown among several trees will be almost invisible in their camouflage.

Outdoors the object is to control access to an area, and not to arouse suspicion. Tuck them here and there, never in a recognizable pattern. Space them out, and fit them in to the existing landscape such that they get full sun, but their hidden or blend in. Fence lines and groups of several together are best. Try to find strains that seem to match the surrounding plants. Feed nitrogen to your plants if they need to be greener to blend in. Some growers even use plastic red flowers, pinned to a plant, disguising it as a flower bush.

Visit the plants at night on full moons, and if your visible to neighbours, appear to be pruning a tree, mowing the lawn, or doing something in the yard that makes you invisible.

Dig a hole and put a potted plant in it. The plant's height will be reduced by at least a foot.

Some growers top the plant when it is 12" high, and grow the 2 tops horizontally along a trellis. The plant will never be over 3 feet tall, and never arouses suspicion from neighbours. This type of plant can even be grown in your yard in full view. Many stories abound of having the neighbours over for a BBQ and nobody ever noticed the nice plants over by the fence...

PLANT FOOD AND NUTRIENTS

Plant foods have 3 main ingredients that will be the mainstay of the garden, Nitrogen, Phosphorus, and Potassium. These 3 ingredients are usually listed on the front label of the plant food in the order of N-P-K. A 20-20-20 plant food has a Nitrogen level of 20%.

Secondary nutrients are Calcium, Sulphur and Magnesium. In trace quantities, boron, copper, molybdenum, zinc, iron, and manganese.

Depending on stage of growth, different nutrients are needed at different times. For rooting and germination, levels of high P nutrients with less N/K are needed. Vegetative growth needs lots of N, and human urine is one of the better sources, (mix 8 ounces to 1 gallon water), although it is not a complete fertilizer unto itself. 20-20-20 with trace elements should do it; I like Miracle Grow Patio food. Watch for calcium, magnesium, sulphur and iron levels too. These are important. One tablespoon of dolomite or hydrated lime is used per gallon of growing medium when a hydroponic medium is first brought on-line, to provide nitrogen, calcium and magnesium. Epsom salts are used to enhance magnesium and sulphur levels in solution.

Tobacco grown with potassium nitrate burns better. Plant foods with PN (P2N3) are foods such as Miracle Grow. This is an excellent fertilizer for vegetative growth, or through the flowering cycle as well. Consider however, potassium nitrate is also known as Salt Peter, and is used to make men have less sexual desire or impotent, such as in mental institutions. So if certain plants are destined for cooking, you might use Fish Emulsion or some other totally organic fertilizer on these plants, at least in the last weeks of flowering.

Most hydroponic solutions should be in the range of 150-600 parts per million in dissolved solids. 300-400 ppm is optimum. It is possible to test your solution or soil with a electrical conductivity metre if your unsure of what your giving your plants.

Keep in mind most dissolved solids readings are usually on the low side, and actual nutrient levels are usually higher. It is possible with passive hydroponics, to get nutrient build-up over several feedings, to the point the medium is over saturated in nutrients. Just feed straight water now and again, until you notice the plants are not as green (slightly), then resume normal feeding.

"Pumping" is when you use more waterings to make the plants grow faster. This is dangerous if you proceed in a reckless manner, due to potential over-watering problems. You must go slowly and watch the plants daily and even hourly at first to be sure your not over-watering the plants. Use weaker plant food mixtures than normal, maybe 25%, and be sure your leaching once a month and running straight water through the plants at least every other time you water. This applies mainly to plants grown in soil mediums.

Use of light strength Oxygen Plus plant food (or Food Grade Hydrogen Peroxide) allows the roots to breath better and prevents problems with over-watering. Check soil to be sure there are no PH anomalies that might be due to Hydrogen Peroxide in the solution. (One experienced

grower told me he would not use H₂O₂ (HP) due to possible PH problems. This should not be a problem if your checking PH and correcting for it in watering solutions.)

Be sure your medium has good drainage. At this point, if your watering soil based plants once a week, you can water every 3-5 days instead if you plant them in a medium with better drainage. Perlite or lava rock will greatly increase the drainage of the medium and make watering necessary more often. This will pump the plants; they will tend to grow faster because of the enhanced oxygen to the roots. Make sure the plant medium is almost dry before watering again, as the plant grows faster this way.

An alternative is to use a standard plant food mixture (stronger) once every 3 waterings. The nutrients are suspended in the medium and stored in the soil for later use. The nutrients are washed out by 2 straight waterings afterward and there is no salts build up in the soil. (Does not apply to hydroponics.)

Stop all plant food 2 weeks before harvesting, so that the plants don't taste like plant food. (This applies to hydroponics as well.)

WARNING: Do not over-fertilize. It will kill your plants. Always read the instructions for the fertilizer being used. Use ½ strength if adding to the water for all feedings in soil or hydroponics if you are unsure of what your plants can take. Build up slowly to higher concentrations of food over time. Novice soil growers tend to over-fertilize their plants. Mineral salts build up over time to higher levels of dissolved solids. Use straight water for one feeding in hydroponics if it is believed the build up is getting too great. Leach plants in pots every month. If your plants look REALLY green, withhold food for a while to be sure they are not being over-fed.

PH AND FERTILIZERS

PH can make or break your nutrient solution. 6.7-6.2 is best to ensure there is no nutrient lock-up occurring. Hydroponics requires the solution to be PH corrected for the medium before exposing to the plants. Phosphoric acid can make the PH go down; lime or potash can take it up when it gets too acid. Buy a PH metre for \$10 and use it in soil, water, and hydroponic medium to make sure your not going alkaline or acid over time. Most neutral mediums can use a little vinegar to make them just this side of 7 ph to 6.5 or so.

Most fertilizers cause a ph change in the soil. Adding fertilizer to the soil almost always results in a more acidic ph.

As time goes on, the amount of salts produced by the breakdown of fertilizers in the soil causes the soil to become increasingly acidic and eventually the concentration of these salts in the soil will stunt the plant and cause browning out of the foliage. Also, as the plant gets older its roots become less effective in bringing food to the leaves. To avoid the accumulation of these salts in your soil and to ensure that your plant is getting all of the food it needs you can begin leaf feeding your plant at the age of about 1.5 months. Dissolve the fertilizer in worm water and spray the mixture directly onto the foliage. The leaves absorb the fertilizer into their veins. If you want to continue to put fertilizer into the soil as well as leaf feeding, be sure not to overdose your plants.

FOLIAR FEEDING

Foliar feeding seems to be one of the easiest ways of increasing yield, growth speed, and quality in a well vented space, with or without elevated CO₂ levels. Just prepare a tea of worm castings, fish emulsion, bat guano, or most any other plant food right for the job and feed in vegetative and early flowering stages. It is not recommended for late flowering, or you will be eating the sprayed-on material later. Stop foliar feeding 2-3 weeks before harvesting. Wash off the leaves with straight water every week to prevent clogging the stomata of the leaves. Feed daily or every other day.

Best times of day to Foliar feed are 7-10Am and after 5 in the evening. This is because the stomata on the underside of the leaves are open then. Also, the best temperature is about 72 degrees, and over 80, they may not be open at all. So find the cooler part of the day if it's hot, and the warmer part of the day if it's cold out. You may need to spray at 2AM if that's the coolest time available. The sprayer used should atomize the solution to a very fine mist; find your best sprayer and use it for this. Make sure the PH is between 7 and 6.2. Use baking soda to make the solution higher PH, and vinegar to make the solution lower PH. It's better to spray more often and use less, than to drench the plants infrequently. Use a wetting agent to prevent the water from beading up, and thereby burning the leaves as they act as small prisms. Make sure you don't spray a hot bulb; better yet, spray only when the bulb has cooled.

Perhaps the best foliar feeding includes using seltzer water and plant food at the same time. This way, CO₂ and nutrients are feed directly to the leaves in the same spray.

Foliar feeding is recognized in most of the literature as being a good way to get nutrients to the plant later when nutrient lockup problems could start to reduce intake from the roots.

WARNING!: It is important to wash leaves that are harvested before they are dried, if you intend to eat them, since they may have nitrate salts on them.

NOTE: One grower who reviewed this document comments: "Fish emulsion smells. Bat guano could be highly unsanitary. Stick to the Rapid-Grow, MgSO₄ (Epsom salts), hydroponic trace element solution. Nitrate salts (The "N" in NPK) are unhealthy to smoke. Personally, I never foliar feed."

Above is a great comment, and there is great wisdom in an organic, non-toxic garden. Personally, I use only CO₂ on my indoor hydroponic plants, and never foliar feed. It simply does not seem to be necessary when using hydroponics.

CO₂

Elevating carbon dioxide levels can increase growth speed a great deal, perhaps even double it. It seems that the plant evolved in primordial times when natural CO₂ levels were many times what they are today. The plant uses CO₂ for photosynthesis to create sugars it uses to build plant tissues. Elevating the CO₂ level will increase the plants ability to manufacture these sugars and plant growth rate is enhanced considerably.

CO2 can be a pain to manufacture safely, cheaply, and/or conveniently, and is expensive to set up if you use a CO2 tank system. CO2 is most usable for flowering, as this is when the plant is most dense and has the hardest time circulating air around its leaves. If you strictly growing vegetatively indoors, (transferring your plants outdoors to flower), then CO2 will not be a major concern unless you have a sealed greenhouse, closet or bedroom, and wish to increase yield and decrease flowering time.

For a medium sized indoor operation, one approach is to use CO2 canisters from welding supply houses. This is expensive initially, but fairly inexpensive in the long run. These systems are good only if your area is not too big or too small.

The basic CO2 tank system looks like this:

20 lb tank	\$100
Regulator	\$159
Timer or controller	\$10-125
Fill up	\$15-20

Worst case = \$395 for CO2 tank set-up synced to a exhaust fan with a thermostat.

CO2 is cheaply produced by burning Natural Gas. However, heat and Carbon Monoxide must be vented to the outside air. CO2 can be obtained by buying or leasing cylinders from local welding supply houses. If asked, you can say you have an old mig welder at home and need to patch up the lawnmower (trailer, car, etc.)

For a small closet, one tank could last 2 months, but it depends on how much is released, how often the room is vented, hours of light cycle, room leaks, enrichment levels and dispersion methods. This method may be overkill for your small closet.

It is generally viewed as good to have a small constant flow of CO2 over the plants at all times the lights are on, dispersed directly over the plants during the time exhaust fans are off.

Opportunities exist to conserve CO2, but this can cost money. When the light is off you don't need CO2, so during flowering, you will use half as much if you have the CO2 solenoid set-up to your light timer. When the fan is on for venting, CO2 is shut off as well. This may be up to half the time the light is on, so this will affect the plants exposure times and amount of gas actually dispensed.

Environmentally, using bottled gas is better, since manufacturing it adds to greenhouse effect, and bottled CO2 is captured as part of the manufacturing process of many materials, and then recycled. Fermenting, CO2 generators, and baking soda and vinegar methods all generate new CO2 and add to greenhouse effect.

CO2 generation from fermentation and generators is possible. A simple CO2 generator would be a propane heater. This will work well, as long as the gases can be vented to the grow area, and a fan is used to keep the hot CO2 (that will rise) circulating and available below at the

plants level. Fire and exhaust venting of the heat are issues as well. A room that must be vented 50% of the time to rid the environment of heat from a lamp and heater will not receive as much CO₂ as a room that can be kept unvented for hours at a time. However, CO₂ generators are the only way to go for large operations.

Fermentation or vinegar over baking soda will work if you don't have many vent cycles, but if you have enough heat to make constant or regular venting necessary, these methods become impractical. Just pour the vinegar on baking soda and close the door, (you lose your CO₂ as soon as the vent comes on). This method leaves a great deal to be desired, since it is not easy to regulate automatically, and requires daily attention. It is possible however, to create CO₂ by fermentation, let the wine turn to vinegar, and pour this on baking soda. It's the most cost-effective set-up for most closet growers, for whom \$400 in CO₂ equipment is a bit much to swallow.

In fermentation, yeast is constantly killing itself; it takes a lot of space. You need a big bin to constantly keep adding water to, so that the alcohol levels will not rise high enough to kill the yeast. Sugar is used quickly this way, and a 10-pound sack will run \$3.50 or so and last about 2-3 weeks. This is also difficult to gauge what is happening as far as amounts actually released. A tube out the top going into a jar of water will bubble and demonstrate the amount of CO₂ being produced.

Try sodium bicarbonate mixed with vinegar, 1 tsp: ~30cc- this will gush up all frothy as it releases CO₂. Do it just before you close the door on your plants. A MUCH cheaper way to provide CO₂ is 2 Oz sugar in 2 litres of water in a bottle [sterilized 1st with bleach and water, then rinsed], plus a few cc urine [!] or if you insist, yeast nutrient from a home brewing supplier. Add brewing yeast, shake up and keep at 25 deg Celsius [~70 F]. Over next 2 weeks or so it will brew up about ½ Oz CO₂ for every Oz sugar used. Keep a few going at once, starting a new one every 3 days or so. With added CO₂ growth is phenomenal!!! I personally measured 38cm growth in 8 days under a 250watt HPS bulb [tubular clear, Horizontal mount].

A good container is a 1-gallon plastic milk jug, with a pin-hole in the cap. Also, the air-lock from a piece of clear tube running into a jar filled with water will keep microbes out and demonstrate the fermentation is working.

A variation is to spray seltzer water on the plants twice a day. This is not recommended by some authorities, and receives great raves by people who seem to feel it has enhanced their crop. It stands to reason this would work for only a small-unvented closet, but may be right for some situations. It could get expensive with a lot of plants to spray. Use seltzer, not club soda, since it contains less sodium that could clog the plants stomata. Wash your plants with straight water after 2 or 3 seltzer sprays. It's a lot of work, and you can't automate it, but maybe that's good! Remember, being with the plants is a beautiful experience, and brings you closer to your spiritual self and the earth. Seltzer is available at most grocery stores (I get it at Lucky's @ .79 for a 2 liter bottle). Club soda will work if seltzer water is not available; but it has twice as much sodium in it. A very diluted solution of Miracle Grow can be sprayed on the plant at the same time. One factor of using seltzer water is it raises humidity levels. Make sure your venting humidity during the dark cycle, or you could risk fungus and increased internodes length.

CAUTION: Don't spray too close to a hot bulb! Spray downward only, or turn off the lamp first.

Even though CO₂ enrichment can mean 30-100% yield increases, the hassle, expense, space, danger, and time involved can make constant or near constant venting a desirable alternative to enrichment. As long as the plant has the opportunity to take in new CO₂ at all times, from air that is over 200 ppm CO₂, the plants will have the required nutrients for photosynthesis. Most closets will need new CO₂ coming in every two or three hours, minimum. Most cities will have high concentrations of CO₂ in the air, and some growers find CO₂ injection unnecessary in these circumstances. Some growers have reported to High Times that high CO₂ levels in the grow room near harvest time lower potency. It may be a good idea to turn off CO₂ 2 weeks before harvesting.

VENTING

You have to vent a lot with a HID lamp, less so for fluorescent. Also, humidity build up requires that you vent at least a few times per day. For a room with a hot lamp that builds up heat quickly, the best vent would be one that cleared the room in 5 minutes, and then would stop for 25 minutes before venting again, or similarly, vent 3 minutes, shut off 12 minutes, etc. The trick is to find a timer that will do this sort of thing. Not easy to find and not cheap. Once you need to regulate CO₂ on and off inversely with the fan, your looking at a \$100 climate controller.

Alternatives are a thermostat that turns on a fan when a certain temperature is reached, and turns it off when the temp recedes 4 degrees. But it is a bitch to coordinate CO₂ release with this one, since you don't know when the fan goes on. \$39 for this thermostat, but to sync it to CO₂ with a voltage-sensing relay is \$100 for the ready-made switch, so then the environment controller at \$100 is cheaper. All you really want is a fan that clears the air in a few minutes, a temperature switch that turns on and off the fan, and an inverse switch that turns off and on the CO₂. If you can vent the room really quick and the heat does not build up too quickly, the CO₂ could be run in a slow, continuous fashion, and would build up in-between the occasional quick exhaust cycles.

Two timers synced can be used, but the only ones cheaply available are the 30 min interval, 48 trips per 24 hours. So I could have a fan run 30 minutes on, then 30 minutes off. I could also sync it to the light so that I don't vent when the lamp is off. I can sync this to an identical timer that will turn on CO₂ during the time that the fan is not on, and vice versa. It would be difficult to sync them closer than 5-10 minutes, but at least there would be a possible inexpensive solution. \$20 for two of these timers.

Fans are expensive to buy for venting, but I just go down to the local electronic parts liquidators and they have muffin fans for \$5-10, so that's a real savings over the \$50-70 these fans cost new at the indoor garden stores. A good vent fan will keep the humidity and temperature down, and distribute CO₂ to your plants from new incoming air.

Internal air movement is very necessary as well. An oscillating fan should be used to circulate air within the grow room, to help circulate CO₂. It will also keep the humidity down,

allowing the air to absorb more moisture, and reduce risk of fungus. A wall mount oscillating fan will not take valuable floor space. The best grow rooms have the most internal air circulation.

TEMPERATURE

Proper temperature is one highly variable factor. Most books state optimum grow temperature to be 70-80 degrees, but many list-extenuating circumstances that allow temperatures to go higher. Assuming genetics is not a factor, plants seem to be able to absorb more light at higher temps, perhaps up to 90 degrees. High light and CO2 levels could make this go as high as 95 degrees for increased growth speed.* An optimum of 95 degrees is new data that assumes very-high light, CO2 enrichment of 1500 ppm and good regular venting to keep humidity down. It is not clear if these temperatures will reduce potency in flowers. It may be a good idea to reduce temperatures once flowering has started, to preserve potency, even if it does reduce growth speed. But higher temperatures will make plants grow vegetatively much faster, by exciting the plants metabolism, assuming the required levels of CO2 and light are available, and humidity is not allowed to get too high.

With normal levels of CO2, in a well vented space, 90 degrees would seem to be the absolute max, while 85 may be closer to optimum, even with a great deal of light available. Do not let the room temperature get over 35 C (95 F) as this hurts growth. Optimal temperature is 27-30 C (80-86 F) if you have strong light with no CO2 enrichment. Less than 21 C (70 F) is too cold for good growth.

Low temperatures at night are OK down to about 60 degrees outdoors, and then start to affect the growth in a big way. Mid 50's will cause mild shock and 40's will kill your plants with repeated exposure. Keep your plants warm, especially the roots. Elevate pots if you think the ground is sucking the heat out of the roots. This is an issue if you have a slab or other type of cold floor.

As temperature goes up, so does the ability of the air to hold water, thus reducing humidity, so a higher average temperature should reduce risk of fungus.

Contrary to many reports, high humidity is not good for plants except during germination and rooting. Lower humidity levels help the plant transpire CO2 and reduce risk of mould during flowering.

Studies indicate the potency of buds goes down as the temperature goes up, so it is important to see that the plants do not get too hot during flowering cycles.

PESTS

You really have to watch pests, or all your efforts could result in little or nothing in return. Mites and Aphids are the worst; whiteflies, caterpillar and fungi are the ones to watch out for long term. Pyrethrum bombs can start you with a clean slate in the room, and then homemade or commercial soap sprays will do most of the rest. When bringing in plants from outside, pyrethrum every broad leaf top and bottom and the soil too. Then watch them closely for a week or two, and soap down any remaining bug life you find from eggs being hatched. This should do the trick for a month or two, long enough it won't be an issue before harvesting.

Fungus is another obstacle in the path of a successful growing season. When the flowers are roughly half developed they become susceptible to a fungus or bud rot. It appears that growing conditions for the fungus are best when temperatures are between 60 and 80 degrees and the humidity is high. The fungus is very destructive and spreads quickly. It is a spore type of fungus that travels to other buds via the wind so it is impossible to prevent or stop if weather conditions permit it to grow. If things should go badly and the fungus starts to attack your plants, you must remove it immediately or it will spread to other areas of the plant or plants.

Some growers will remove just the section of the bud that is infected whereas other growers will remove the entire branch. Removal of the entire branch better insures that the fungus is totally re- moved, and also enables the grower to sample the crop a few weeks ahead of time.

Fungi can wipe your crop quick, so invest in some SAFE fungicide and spray down the plants just before flowering if you think fungus may be a problem. Don't spray the plants if you have never had problems with fungus before. Keep humidity down, circulate air like crazy in the grow space and keep uncurtained outdoor plants out of the indoor space. Don't wait until after flowering, since it's not a good idea to apply the fungicide directly to flowers. Instead, flowers must be cut off when they are infected.

Most fungicides are very nasty, and you won't want to ingest them, so it is necessary to use one that is safe for vegetables. Safer makes a suitable product that is available at most nurseries; it contains only sulphur in solution.

Use soap solution like Safer Insecticidal Soap to get rid of most aphid problems. Use some tobacco juice and chilli pepper powder added to this for mites. Dr. Bronnars Soap can be used with some dish detergent in a spray bottle if you want to save money.

Pyrethrum should only be used in extreme circumstances directly on plants, but can be used in a closet or greenhouse in the corners to get rid of spiders and such. It breaks down within a week to non-toxic elements, and can be washed from a plant with detergent solutions and then clear water.

I find Pyrethrum to be the best solution for spider mites, if it is sprayed on young plants up to early flowering. Into later flowering, the tobacco and pepper/soap solution is your best bet, on a daily basis, on the under-sides of all infected leaves.

Spider mites are by far the worst offender in my garden. I have finally learned not to bring plants from outside into the indoor space. They are always infected with pests and threaten to infect the entire indoor grow space. It is much more practical to work WITH the seasons and regenerate plants outdoors in the Summer, rather than bringing them indoors to regenerate under constant light. Start a plant indoors; take it outside in spring to flower. Take a harvest or two; feed it nitrogen all summer and it will regenerate naturally, to be flowered again in the fall.

Once a plant has been taken outside, leave it outside.

TRANSPLANTING

There will be little or no shock if you are quick and tender in your handling of the plants. Make sure you only need to transplant twice, or better yet, once if possible, through the entire growth cycle. Transplanting slows you down. It takes time, it's tricky, it's hard work, and threatens the plants. Start in as large a container as possible, square is best. 16 ounce plastic cups work OK, and 2 liter soda bottles cut down may be big enough for the first harvest when growing hydroponically. One-gallon plastic milk or water containers (squarish) will work too.

Or start seeds and rooted cuttings in 16 oz plastic cups. It's better to have fewer seedlings than it is to have many seedlings that need constant transplanting. These larger cups take only a little more space, and allow you to transplant only one time before harvesting the first crop. Transplant into a gallon water jugs (cut down to 3/4 gallon) before forcing flower growth. To regenerate this plant after harvesting, transplant it into a larger pot after it goes into vegetative growth once again, 5 gallon paint buckets work pretty well if you can spare the space, and a 2-3 gallon container would make this plant's 2nd harvest better than the first, given enough vegetative regrowth first.

One more tip:

A Russian study showed that seedlings with at least 4" of soil to grow the taproot were more likely to go female. The source I'm quoting says "This may be why some farmers get female/male ratios as great as 80%/20%."

EARLY SEXING

It's possible to tell the sex of a plant early, and thus move male plants out of the main growing area sooner by covering a plant's lower branch for 12 hours a day while it's in a constant light vegetative state. Use a black paper bag or equivalent to allow for airflow while keeping out light. Be sure to set up a regular cycle for these covered branches. If light is allowed to reach them during the dark period, they may not indicate early at all.

Use a magnifying glass to look at the early flowers sex type. A male plant will have a small club (playing card) looking preflower with a small stem under it. A female flower is usually a single or double pistil, white and wispy, emerging from an immature calyx.

Some people like to pre-force plants when they are 8" tall, in order to weed out the males. When growing outdoors, many growers do not wish to devote time, space or energy to male plants. Just put the plants on 12 hours light cycle for 2 weeks, separate the females from the males, and then revert the light cycle back to 18-24 hours to continue vegetative growth for the females. Keep in mind, this is a time consuming process and can put the plants back 2 weeks in growth. Don't pre-force plants unless you have lots of time. Just cover one branch per plant with black paper (light tight, breaths air) 12 hours every day under constant light to force pre-flowers and differentiate early.

REGENERATION

It is possible to harvest plants and then rejuvenate them vegetatively for a 2nd and even 3rd harvest. A second harvest can be realized in as little as 6-8 weeks. Since the plant's stalk, and roots are already formed, the plant can produce a second, even third harvest of buds in a little more than half the time of the original harvest. When harvesting, take off the top 1/3 of the

plant. Leave most healthy fan leaves in the middle of the plant, cutting buds off branches carefully. On the lower 1/3 rd of the plant, take off end flowers, but leave several small flowers on each branch. These will be the part of the plant that is regenerated. The more buds you leave on the plant, the faster it will regenerate. Feed the plant some Miracle Grow or any high nitrogen plant food immediately after harvest. When you intend to regenerate a plant, make sure it never gets too starved for nitrogen as it is maturing, or all the sun leaves will fall off, and your plant will not have enough leaves to live after being harvested.

Harvested plants can come inside for rejuvenation under continuous light or are left outside in Summer to rejuvenate in the natural long days. It will take 7-14 days to see signs of new growth when regenerating a plant. As stated before, and in contrast to normal growth patterns, lower branches will be the first to sprout new vegetative growth. Allow the plant to grow a little vegetatively, then take outside again to reflower. Or keep inside for vegetative cuttings. You now have two or three generations of plants growing, and will need more space outside. But you will now be harvesting twice as often. As often as every 30 days, since you have new clones or seedlings growing, vegetative plants ready to flower, and regenerated plants flowering too.

Regenerating indoors can create problems if your plants are infected with pests. It may be best to have a separate area indoors that will not allow your plants to infect the main indoor area. An alternative to regenerating indoors is to regenerate outdoors in the Summer. Just take a harvest in June, then allow the plant to regenerate by leaving some lower buds on the plant, and leaving the middle 1/3rd of the plant's leaves at harvest. Feed it nitrogen, and make sure it gets lots of sun. It will regenerate all Summer and be quite large by Fall, when it will start to flower again naturally.

PRUNING

Plants that are regenerated, cloned and even grown from seed will need to be pruned at some point to encourage the plant to produce as much as possible and remain healthy. Pruning the lower limbs creates more air-flow under the plants in an indoor situation and creates cuttings for cloning. It also forces the plant's effort to the top limbs that get the most light, maximizing yields.

Plants that are regenerated need to have minor growth clipped so that the main regenerated growth will get all the plant's energy. This means that once the plant has started to regenerate lots of growth, the lower limbs that will be shaded or are not robust should go. The growth must be thinned on top branches such that only the most robust growth is allowed to remain.

One nice aspect of regenerating plants is that some small buds left on the plant in anticipation of regeneration will not sprout new growth and may be collected for smoke. The plant may provide much smokable material if it is caught before all the old flowers dry up and die with the new vegetative growth occurring.

Try to trim a regenerated plant twice. Once as it is starting to regenerate, collect any bud that is not sprouting with new growth and smoke it. Then later, prune again to take lower clippings to clone and thin the upper growth so that larger buds will be produced.

If a regenerated plant is not pruned at all, the resulting plant is very stemmy, does not create large buds and the total yield will be significantly reduced.

HARVESTING AND DRYING

Harvesting is the reaping of the bounty, and is the most enjoyable time you will spend with your garden.

Plants are harvested when the flowers are ripe. Generally, ripeness is defined as when the white pistils start to turn brown, orange, etc. and start to withdraw back into the false seed pod. The seed pods swell with resins usually reserved for seed production, and we have ripe sinse buds with red and golden hairs.

It is interesting that the time of harvest controls the "high" of the buds. If harvested "early" with only a few of the pistils turned color, the buds will have a more pure THC content and will have less THC that has turned to CBD and CBN's. The lessor psychoactive substances will create the bouquet of the pot, and control the amount of stoniness and stupidity associated with the high. A pure THC content is very cerebral, while high THC, high CBD, CBN content will make the plants more of a stupid, or hazy buzz. Buds taken later, when fully ripened will normally have these higher CBN, CBD levels and may not be what you prefer once you try different samples picked at different times. Don't listen to the experts, decide yourself based on what you come to like yourself.

Keep in mind, a bud weighs more when fully ripe. It is what most growers like to sell, but take some buds early for yourself, every week until you harvest, and decide how you like it for yourself. Grow the rest to full maturity if you plan to sell it.

Most new growers want to pick early, because they are impatient. That's OK! Just take buds from the middle of the plant or the top. Allow the rest to keep maturing. Often, the tops of the plants will be ripe first. Harvest them and let the rest of the plant continue to ripen. You will notice the lower buds getting bigger and fuzzier as they come into full maturity. With more light available to the bottom portion of the plant now, the plant yields more this way over time, than taking a single harvest.

Use a magnifier and try to see the capitated stalked trichomes (little THC crystals on the buds). If they are mostly clear, not brown, the peak of floral bouquet is near. Once they are mostly all turning brownish in colour, the THC levels are dropping and the flower is past optimum potency, declining with light and wind exposure rapidly.

Don't harvest too late! It's easy to be too careful and harvest late enough potency has declined. Watch the plants and learn to spot peak floral potency.

Do not cure pot in the sun, it reduces potency. Slow cure hanging buds upside down in a ventilated space. That is all that is needed to have great sensi. Drying in a paper bag works too, and may be much more convenient. Bud tastes great when slow dried over the course of a week or two.

If your in a hurry, it's OK to dry a small amount in-between paper sheets or a paper bag in a microwave oven. Go slow and check it, don't burn it. Use the defrost power setting for a slower, better drying. It will be harsh smoking this way though.

A food dehydrator or food preserver will dry your pot in a few hours, but it will not taste the same as slow-dried. Very close though. And this will speed your harvest time (which can be nerve-wracking, with all this pot hanging around drying.)

Dry buds until the stems are brittle enough to snap, then cure them in a sealed tupperware container, burping air and turning the buds daily for two weeks.

Once experienced grower told me to dry in an uninsulated area of the house (like the garage) so that the temperature will rise and fall each night, as the plant is drying. If you treat the plant as if it were still alive, it will use some of its chlorophyll while it is drying, and the smoke will be less harsh.

CLONING

Cloning is asexual reproduction. Cuttings are taken from a mother plant in vegetative growth, and rooted in hydroponic medium to be grown as a separate plant. The offspring will be plants that are identical to the parent plant.

Cloning preserves the character of your favourite plant. Cloning can make an ocean of green out of a single plant, so it is a powerful tool for growing large crops, and will fill a closet quickly with your favourite genetics. When you find the plant you want to be your "buddy" for the rest of your life, you can keep that plant's genetic character alive for decades and pass it on to your children's children. Propagate and share it with others, to keep a copy, should your own line die out. A clone can be taken from a clone at least 20 times, and probably more, so don't worry about myths of reduced vigour. Many reports indicate it's not a problem.

Cloning will open you to the risk of a fungus or pests wiping out the whole crop, so it's important to pick plants that exhibit great resistance to fungus and pests. Pick the plant you feel will be the most reliable to reproduce in large scale, based on health, growth rate, resistance to pests, and potency. The quality of the high, and the type of buzz you get will be a very important determining factor.

Take cuttings for clones before you move plants from vegetative grow area to the flowering area. Low branches are cut to increase air circulation under the green canopy. Rooted clones are moved to the vegetative growth area, and new clones are started in the cloning area.

using the low branch cuttings. Each cycle of growth will take from 4-8 weeks, so you can constantly be growing in 3 stages, and harvesting every 6-8 weeks.

Some types of plants are more difficult to clone than others. Big Bud is reported to not clone very well. One of my favourite plants, Mr. Kona, is the most amazing pot I ever smoked, but it is hard as hell to clone. What a challenge! I noticed other varieties that were rooting much quicker, but it was the stone I was after! Once you find the psychoactive, almost hallucinogenic properties of some Indica/Sativa hybrids, you never want to smoke a pure Indica again. Indica is however, great medicinally, so I like to grow a few pure strains too.

If a plant is harvested, you can sample it, and decide if you want to clone it. Pick your favourite 2 or 3 distinctly different types of plants to clone, based on trying the harvested plants. The plants you want to clone can be regenerated by putting them in constant light. In a few weeks, you will have many vegetative cuttings available for cloning and preserving your favourite plants. Always keep a mother plant in vegetative mode for any strain you want to keep alive. If you flower all your clones, you may end up killing off a strain if you don't have any plant devoted to being a mother. I killed off a sacred strain accidentally this way; my harvested plants failed to regenerate and the strain would have died completely had not previously I've given it to friends to grow it as well. I was in luck, and a buddy set me up with another clone of this strain to grow as a mother plant for a new crop of clones.

After two months, any marijuana plant can be cloned. Flowering plants can be cloned, but the procedure may take considerably longer. Its best to wait, and regenerate vegetatively plants that have been harvested. A single regenerated/harvested plant can generate hundreds of cuttings. Before taking cuttings, starve the plant for nitrogen for a week at least, so that the plant is not extremely green, as this will make rooting take longer. Take cuttings from the bottom 1/3 of the plant, when doing ordinary pruning. Cut young growth tips from a vegetative stage, mature plant 3-5 inches long with a stem diameter 1/5-1/10 inch. Cut with a sterile razor blade or X-acto knife (flamed) and immerse the cut end of the clone into a tub of distilled water mixed with 1/4 tspn Peters 5-50-17 per gallon. Next, cut the bottom .2 inch off the end while it is submerged, using a diagonal cut. Remove the clone from the tub and dip into a liquid cloning solution following instructions on the label. Dust with RootToneF and place in cloning tray or medium. Flowering plants can be cloned too, but may take longer, and may not have as high a success rate.

Cloning goes quickest with the liquid rooting solutions, in a warmed, aerated tray, with subdued lighting and high humidity. Placing cuttings into 1" rockwool cubes in a covered tray works great too. In a closet, you can make space above the grow area so that the heat of the lamp warms the tray (passive collecting) and spare the expense and hassle of the aquarium heater (\$24) or agricultural heating pad w/ thermostat (expensive). A double 4" fluorescent lamp will be perfect. Leave lamps on for 24 hours a day. Cuttings should root in 2-3 weeks.

I found only one liquid rooting hormone solution that was not over \$10. (Olivia's Gel was \$12 for a 1.6 ounce bottle. Geez, what is this stuff, gold?) I found some dipNgrow for \$9,

considered myself lucky, and got a tray and clear cover for \$7. A clear tray cover or greenhouse encloser is needed to bring up humidity to 90% (greenhouse levels). Liquid rooting hormone seems to be much more effective than powders. Some types available are Olivia's, Woods, and dipNgrow.

Mix a weak cloning solution of high P plant food (such as Peter's 5-50-17), trace elements, and epsom salts and then dip plants in rooting solution per instructions on label. All of the above nutrients should be added in extremely small amounts, 25% of what would normally be used on growing plants. Or use a premade solution such as Olivia's Rooting Solution. Corn syrup has been reported to supplement the sugars needed by the plant during cloning, since it consists of plant sugars.

Use a powder fungicide too, like RoottoneF to be sure you don't spoil the clones with fungus. This is important, since clones and fungus like the conditions you will be creating for good rooting:

mild light

72-80 degrees high humidity

In rockwool, there is no need for airating the solution, just keep the cubes in 1/4" of solution so they wick and stay moist at all times. Try to keep clones evenly spaced, and spray them with water once a day to keep them moist and fresh. Pull out clones if they are diseased and dying, to keep them away from healthy starts.

Another method is to float cuttings in a tray full of solution on polystyrene disposable plates, or styrene sheets (shipping/packing material) with holes punched, so the tops and leaves are out of the water. Take off all large leaves, leaving only smaller top leaves to reduce demand on the new rooting stalk. Aerate the tray solution with an air pump and bubble stone. Keep solution at 72-80 degrees for best results. Change the solution daily if not using an air stone and pump, so that oxygen is always available to the cuttings. A week later, clip yellowing leaves from cuttings to reduce water demands as the cuttings start to root.

Buy a tray with a clear cover made for rooting at an indoor gardening supply house. You must keep humidity very high for the clones. Put cuttings in an ice chest with cellophane over the top and a light shining down if you don't want to pay for the grow tray and cover.

It's also possible to directly place a dipped cutting in a moist block of floral foam with holes punched, or vermiculite in a cup; be sure to root cuttings in a constantly moist medium. Jiffy peat cubes are not recommended, as published reports indicate results were not good for rooting clones. Place starter cubes in tray of solution. Check twice a day to be sure cubes are moist, not drenched, and not dry. After about 2-3 weeks, rootlets will appear at the bottom of the pods. Transplant at this point to growing area, taking care not to disturb any exposed roots.

One grower writes us:

I have had virtually all attempted clones root with the following scheme:

0. Prep cutting by removing large leaves on tip to be cut, allow to heal.
1. While holding underwater, take final diagonal cut on stem to be rooted.
2. Dip in Rootone, then spear stem about 2" deep in 16 oz. cups of ½ vermiculite, 1/2 perlite, which are kept in a styrofoam cooler.
3. Spray cuttings with a VERY mild complete fert. soln.
4. Cover top of cooler with Saran Wrap, then punch holes for ventilation.
5. Keep cooler in relatively mild temps, low light, and spray cuttings daily.
6. Cuttings should root in about 3 weeks.

Cloning is not as easy as starting from seed. With seeds, you can have 18" tall plants in 6 weeks or less. With clones, it may take 6 weeks for the plant to sprout roots and new growth. Seeds are easily twice as fast if you have empty indoor space being wasted that needs to be put to use quickly. Always breed a few buds for seeds, even if you expect to be cloning most of the time, you could get wiped out, and have nothing but your seeds left to start over.

Cloning in rockwool seems to work great, and no airpump is needed. I paid \$9 for 98 rockwool starter cubes. A plastic tray is available (\$.95) that holds 77 cubes in pockets allowing the cubes to be held in a tray of nutrient solution. They are easily removed and placed in a larger rockwool growing cube when rooted.

BREEDING

It is possible to breed and select cuttings from plants that grow, flower, and mature faster. Some plants will naturally be better than others in this regard, and it is easy to select not only the most potent plants to clone or breed, but the fastest growing/flowering plants as well. Find your fastest growth plant, and breed it with your "best high" male for fast flowering, potent strains. Clone your fastest, best high plant for the quickest monocrop garden possible. Over time, it will save you a lot of waiting around for your plants to mature.

When a male is starting to flower (2-4 weeks before the females) it should be removed from the females so it does not pollinate them. It is taken to a separate area. Any place that gets just a few hours of light per day will be adequate, including close to a window in a separate room in the house. Put newspaper or glass under it to catch the pollen as the flowers drop it.

Keep a male alive indefinitely by bending it's top severely and putting it in mild shock that delays it's maturity. Or take the tops as they mature and put the branches in water, over a piece of plate glass. Shake the branches every morning to release pollen onto the glass and then scrap it with a razor blade to collect it. A male pruned in this fashion stays alive indefinitely and will continue to produce flowers if it gets suitable dark periods. This is much better than putting pollen in the freezer! Fresh pollen is always best.

Save pollen in an air tight bag in the freezer. It will be good for about a month. It may be several more weeks before the females are ready to pollinate. Put a paper towel in the bag with it to act as a descant.

A plant is ready to pollinate 2 weeks after the clusters of female flowers first appear. If you pollinate too early, it may not work. Wait until the female flowers are well established, but still all while hairs are showing.

Turn off all fans. Use a paper bag to pollinate a branch of a female plant. Use different pollen from two males on separate branches. Wrap the bag around the branch and seal it at the opening to the branch. Shake the branch vigorously. Wet the paper bag after a few minutes with a sprayer and then carefully remove it. Large plastic zip-lock bags also. Slip the bag over the male branch and shake the pollen loose. Carefully remove the bag and zip it up. It should be very dusty with pollen. To pollinate, place it over a single branch of the female, zipping it up sideways around the stem so no pollen leaks out. Shake the bag and the stem at the same time. Allow to settle for an hour or two and shake it again. Remove it a few hours later. Your branch is now well pollinated and should show signs of visible seed production in 2 weeks, with ripe seeds splitting the calyxes by 3-6 weeks. One pollinated branch can create hundreds of seeds, so it should not be necessary to pollinate more than one or two branches in many cases.

When crossing two different varieties, a third variety of plant will be created. If you know what characteristics you are looking for in a new strain, you will need several plants to choose from in order to have the best chance of finding all the qualities desired. Sometimes, if the two plants bred had dominant genes for certain characteristics, it will be impossible to get the plant you want from one single cross. In this case, it is necessary to interbreed two plants from the same batch of resultant seeds from the initial cross. In this fashion, recessive genes will become available, and the plant character you desire may only be possible in this manner.

Usually, it is desirable only to cross two strains that are very different. In this manner, one usually arrives at what is referred to as "hybrid vigour". In other words, often the best strains are created by taking two very different strains and mating them. Less robust plants may be the result of interbreeding, since it opens up recessive gene traits that may lead to reduced potency.

Hybrid offspring will all be very different from each other. Each plant grown from the same batch of seeds collected from the same plant, will be different. It is then necessary to try each plant separately and decide its individual merits for yourself. If you find one that seems to be head and shoulders above the rest in terms of early flowering, high yield and get buzz, that's the plant to clone and continue breeding.

In depth genetics is beyond the scope of this work. See Marijuana Botany; Smith, for more detailed info in this area.

SINSEMILLIA

When the female plant is not allowed to pollinate, it grows full of resin that was intended to make seeds. False seed pods swell with THC laden resin and the pistils turn red and orange and withdraw into the pods. Then the plant is harvested.

Seeds are not part of the bud when the flowers mature. This is called Sinsemillia, and simply means "no seeds".

SINSE SEEDS

It is possible to cross your favourite two female plants to create a new strain of seeds that will produce all female plants. Preferably, these two plants will be different types of plants, not from the same mother's seeds.

This will create the best offspring, since it will not lead to inbreeding. It is easier to gauge the quality of female plants than male plants, since the smoke is more potent and easier to judge its finer qualities. Plants from seeds created in this fashion will be all female plants since there will be no chance of male chromosomes from female parents.

Use Gibberellic Acid on one branch of a female plant to induce male flowers. Gibberellic Acid is sold by nursery supply houses for plant breeding and hybridizing. Spray the plant once every day for 10 days with 100 ppm gibberellic acid. When the male flowers form, pollinate the flowers of your other target female plant you have selected. Just pollinate one branch unless you want lots of seeds!

Once the branch has male flowers, cut the branch and root it in water, with glass under it to catch the male pollen when it drops. Use a rooting solution similar to the above cloning solution. Collect the pollen with a plastic bag over the branch and shake it. Use a razor blade to scrap up fallen pollen and add it to the bag too.

It is also possible to pollinate the flowers of the plant you create the male flowers on, crossing it with itself. This is used to preserve a special plant's characteristics. Cloning will also preserve the plant's characteristics, but will not allow you to store seeds for use later. Crossing a plant with itself can lead to inbreeding problems, so it may not be the optimum solution in many cases.

I once tried using Gibberellic Acid, sprayed on a healthy female, every day for over a week. No male flowers appeared on the plant. Your mileage may vary.

ODOURS AND NEGATIVE IONS

Negative ion generators have been used for years now to cut down on odours in a grow room, but reports are coming in that a negative ion generator will increase growth speed and yield. No true evidence to support this, however it does make sense, due to the fact that people and animals seem to be altered in a positive way by negative ions in the air, so plants may "feel" better too. Try putting one in the grow room. You may notice the buds don't have as much scent when picked, but that may be desirable in some cases.

A negative ion generator can be purchased for \$15 to \$100 depending on the type and power involved. Some have reversed cycles that collect the dust to a charged plate. It is also possible to use grounded aluminum foil on the wall and shelf where the ionizer sits, to collect these particles. Just wipe the foil clean once a month. It should be grounded to an electrical

outlets ground wire. If you don't cover the wall and shelf with paper or foil, the wall will turn dark with dust taken from the air, and you will have to repaint that wall later.

OXYGEN

O₂ to the roots is a big concern, since the plant requires this for nutrients to be available, and to rid itself of toxins, etc. One of the easiest things to do is use food grade hydrogen peroxide in the water to increase the availability of oxygen in the water. H₂O₂ has an extra oxygen atom that will easily break away and can be used by the plant. Oxygen Plus is a plant food that contains 25% hydrogen peroxide and is perfect for this use.

Using a planting medium that allows for plenty of aeration is also really important. Be sure you have good drainage by using Perlite, sand, or gravel in your mix and at the bottom of pots. Don't use a medium that holds too much water, or you may significantly reduce the oxygen available to the plant. More on that in the section on hydroponics.

Aerating the water before watering is also a good idea. In the case of soil potted plants, use an air pump to aerate the water overnight before watering your plants, or put the water in a container with a cap and shake it up real good before giving to the plants.

SAFETY AND PRIVACY

Utility companies can tell your bill is way off from the same time last year, and police are finding growers this way. More than 500 watts in the family home running constantly will show up as a regular monthly increase in electricity use. You can claim space heaters, more people living on the premises, too many television sets, and late hours, if they happen mention it to you (innocently). If the police knock and ask you about it, don't let them in, and move your plants to another location during the wee hours in a vehicle not your own.

Upon moving into a new place, it may be desirable to immediately establish high electricity use, so that your electrical use history won't reveal your activities in the future...

Light leaks, open windows, heat expelled from rooms that would normally be cool, and rip-offs are all serious issues to be concerned about. Don't use a burglar alarm on when you're away from the house. People are busted this way when the kids try to rip off the garden and the police come. Lock the house up well, and let them take it if they need it so bad. It's not worth getting busted for a burglary...

Think ahead to any situation that will require outsiders to visit sensitive areas of the house. Repairmen, solicitors, metre readers, neighbours, appraisers, and pets should all be considered and contingency plans made in advance.

DISTILLED WATER

Some growers report purified or distilled water helps their plants grow faster. Perhaps due to sodium and heavy metals found in hard water that are not present in purified water. Hard water tends to build up alkaline salt deposits in soil that lockup trace minerals, and cause iron, copper and zinc deficiencies. There are several types of purified water, but many are not free of minerals that could be causing salt build up over an extended period of time.

Tap water comes in two flavours. Hot and cold. The cold pipe has less calcium and sodium build up in it, and should be freer of sediment once the water has been turned on and allowed to flow for 30 seconds. Hot water will have rust, lead deposits, and lots of sodium and calcium, so much so, you will see it easily. Use only the amount of hot water needed to make the water the correct temperature (70-80 F). Tap water filtered through a carbon (charcoal) filter will be free of chlorine and most large particles, but will still contain dissolved solids such as sodium and heavy metals (lead, arsenic, nickel, etc.).

Purified bottled water will be either Reverse Osmosis or some form of carbon/sediment-filtered water. When purchasing water at a store, unless it says RO or Distilled, don't bother buying it. It could still have the same dissolved solids and heavy metals your tap water has.

BIRTH CONTROL PILLS

A solution of one pill to one gallon of water has been reported to cause increased growth speed in tomato plants. It is possible this will help herb plants too. One treatment administered before flowering and one administered a few weeks before harvesting might help the plant mature faster.

One grower told a story of the same type of plants, one administered the estragon grew to 20 feet, while the other was 7 feet. This may be purely anecdotal, but it may work. Try it and report back to us on results.

SEED AND BUD STORAGE

Use a seal-a-meal to hermetically seal the bag with no air inside. Freeze or refrigerate, and bud and seed can be kept for years this way.

Rap seeds in a paper towel to absorb moisture. Keep them in the freezer, and pull out only as many seeds as you need, then pop them back in the freezer quickly.

A FINAL COMMENT:

Good results can be had even in what appear to be rather marginal situations. (i.e.: a four-inch pot in a room with a skylight.) With the minimum of: well drained medium, good light with ventilation, regular application of a complete fertilizer, pest control, and avoidance of detection, anyone can take a viable seed to maturity.

One need not have a lot of money, or even know-how to grow good plants.

Curing Marijuana

Once you have learned how to grow a crop the next step is to cure it. You don't want to always smoke weed that's harsh and bad tasting. Here are some basic tips and a few advanced ones you can experiment with.

Preparing The Harvest

Curing your harvest is an important step in the cultivation process. Many new growers are so eager to try the product they don't even wait for it to mature. They cut off buds that aren't ripe and dry them out fast. I've heard of people putting buds in the microwave because they couldn't wait for them to dry. If taste, aroma and maximum potency is important to you then you want to cure your buds and not just dry them. There are many ways to do this and I'm just going to go over a few basic things. You can find whole books on the subject if you are interested. See the bottom of this page for books.

The First Steps.

Preparations must be made well before curing begins. The experienced grower harvests his crop when 50 to 80% of the pistles have turned color. If you have grown out the strain before you have a good idea when they will be ready. You will need to clear the plants of nutrients (fertilizer) right before you harvest. The growing medium and the plants themselves store some of the nutes you have given them. This will give a nasty taste if you harvest without clearing it out. Excessive nutes will also make the buds hard to burn. Plants need fertilizer to grow and mature so you want to wait right before you are going to harvest and give them plain water. They will use up the ferts they have stored and will not slow down noticeably. If you are using hydro start clearing 3 to 7 days before harvest. This can be done by changing the solution and using only plain water. Some growers will change the solution twice because the rockwool or grow rocks may hold a little. With soil you need to change to plain water at least a week and preferably two weeks before harvest depending on how much soil in each pot. Don't use slow release ferts because they are very hard to clear out. Outdoor farmers who need to use slow release can time it and use just liquid ferts toward the end. So now you have harvested right at the peak. You cleared out the nutes beforehand and you have fragrant, spicy highly potent buds you want to preserve. The most important thing is that they must be dried. Mold is your biggest enemy once you harvest. If you have excessive moisture in the grow room you may have battled mold well before harvest and afterwards it's even more difficult. The trick is to dry them slowly so that certain biochemical processes can go on but not so slowly that mold can get a foot hold. The key is to control humidity. A good cure can last up to 8 weeks or more and will leave you with a stash that's tasty and fragrant and which has lost none of it's potency. A poor cure will leave you with nasty tasting bud that's harsh on the throat. A poor cure can even cost you your harvest.

Curing The Crop

Immediately after the harvest comes the cure. The reasons for curing and not just quick drying your crop are to make the herb sweet smelling and smokable. You want it mild not harsh and you want a good smell and flavor. After all that work don't ruin it with a too quick cure. A good cure lasts for from 3 to 8 weeks but good results can be had in two weeks or so. The idea is to remove the water slowly enough to let biological processes take place that convert the sugars and starches into harmless and flavorful compounds. Sugar or starch will give a harsh smoke that hurts the lungs. Plants need sugars to live on and they produce them from fertilizer and sunlight. This curing process also breaks down some of the chlorophyll which give herb it's green color. Too much chlorophyll gives an unwanted leafy taste. Your main enemy when you are curing is mold. After pot is dried it's not very susceptible to mold but you have to maintain a certain level of humidity to let the curing process do it's work. The way you control humidity is by controlling how much ventilation you allow. You want some ventilation but not too much. Too much and it dries out without curing properly, too little ventilation and you may get mold. If you see or smell the slightest sign of mold you must immediately stop the cure and let it dry out. If mold is unchecked it can destroy your crop in short order. Mold can be detected by sight and smell. It looks white usually and will be fuzzy. If you see it in one part you can be sure the spores are all over so you may as well let it dry. Mold also has an odor which is always nasty. Never ever smoke herb that has mold on it. You want to avoid light and heat at all times with your crop after it has been

Curing Marijuana

harvested. Light will destroy it and temps over about 80 F (27 C) are bad. The best place to store it is in the freezer or fridge. If that's not practical a cool dry dark place will do. You need an enclosure to put your crop in for the cure. Depending on the size of your crop you can use a cardboard box, a closet or an unused room. With the cardboard box you want to hang the plants from a string. Don't just dump everything into the box because the plants on the bottom won't get enough air and may turn moldy. I used to put string across the open top of the box and tape the ends to the outside. I would crisscross several strings and attach the plants with twist ties. Make sure the box is tall enough for your plants. If it's not tall enough you can cut the plant in half or even cut off each branch and hang it in the box. The plants or branches should be loose and have some space between it and the next. It doesn't take a lot of space just as long as air can circulate. With a closet you do the same thing. You might want to put nails or thumbtacks in the walls for the strings or the clothes hanger bar may be enough. If you use a whole room you need to set up something to keep the plants hanging upside down off the floor. The first few days you allow more ventilation and as the plants get dryer you allow less. In the box leave the top off, with the closet leave the door open and if you use the whole room leave the door open and use a fan to blow air in. After one or two days you will have lost a good bit of moisture and you can begin to restrict air flow.

I used to put a section of newspaper over the top, not quite covering the whole top of the cardboard box. As the cure progressed I would cover the top more and more. As soon as the leaves began to get stiff I'd cover the top completely. They still got a little air because the newspaper was not airtight. With a closet after a day or two close the door all except for a couple inches. As the cure progresses and the plants get drier, close the door altogether. Almost all closets have cracks around the door that air can come through. If you have a very large closet treat it like a room. When using a whole room to cure, after a day or two of letting the fan blow air in, close the door part way. With the room cure it's a good idea to have a fan inside moving the air around and another fan in the doorway blowing fresh air in. Watch the plants very closely to see how fast they are drying. As soon as you notice a little bit of stiffness to the stems they have lost probably 50% of their moisture. When the leaves start to get a little bit crisp you have lost most of the excess moisture and you must restrict ventilation some more. Using a whole room at this point you turn off the fan blowing air in but you leave the door open a little. You never cut off ventilation completely because mold is a threat right up until the end. The leaves should start to get a little crisp after a week or two. If it happens sooner you may be using too much ventilation and should cut back. Along about this time you should notice a very nice smell. This is the curing smell and it smells a little like baking bread along with a piney or fruity or skunky smell from the pot. This is the nice smell you want your herb to have. If you notice the least bit of a nasty or rotten smell it is probably mold and you need to check very closely. After the leaves start to get a little stiff and you have restricted the air flow it takes anywhere from a week to 6 weeks more to finish it. When to stop is up to you. You might want to decide by the color of the herb. It gets less green as it goes along. Buds will retain the green color longer than will the leaves. Buds may still be green at the end of the cure but not quite as bright a shade of green. You will be the proud possessor of a stash of sweet smoking, good tasting buds without the harshness of fresh cured smoke.

Adding Flavors

People pay a lot of money to get seeds they think will grow pot that smells like blueberries or chocolate or something else. Often these strains are hard to grow or may not be as potent or high yielding as other less expensive varieties. People want to know if orange bud smells and tastes like an orange. With the proper techniques you can make your favorite variety smell and often times taste like anything you want. You want to do this without ruining the cure. It's no point having blueberry pot that burns your throat or doesn't get you high. Do not pour any syrup or similar flavorings on your pot. The sugar will make it very harsh and you are inviting mold. There are better ways. The best flavor enhancing starts while the plant is still growing. You can do a certain amount while it's curing and you can even affect the smell/flavor somewhat after it's been cured. There are two main approaches, inside out and outside in. You can apply flavors inside the plant while it's still growing and you can try to add flavors after it's been harvested but this is

Curing Marijuana

from the outside. Anything you put in your plants water will affect the taste of the finished product particularly if you harvest it right afterwards. I learned this about 20 years ago the hard way. I fertilized using fish emulsion right before I topped the plant. Bad move! The resulting top smelled like fish and had a foul taste. What you want to do is select a flavoring that is very concentrated. Lets take orange for an example. You could use orange juice but if you could find concentrated orange extract you would have less pulp etc to deal with. You will find some concentrated flavor extracts in the grocery store. Want your pot to smell like vanilla? Vanilla extract is cheap and readily available, so is lemon extract (cooking variety). Other extracts can be found in stores that specialize in baking supplies. Let's say you can't find any of that and you want to use what you have on hand. I took the example of orange flavoring. If all you have is orange juice you could use that. I would suggest filtering it first to get out as much of the pulp as possible. A coffee filter works well but it'll take a while to filter it all. You may have to change filters a few times. Those with hydroponic units will shudder at the thought of a lot of goop going through their system. That's why I suggested the concentrated extracts if you can find them. It's important to do this shortly before harvest. For one thing, most extracts including the ones you make up yourself have a lot of sugar in them. This sugar will ferment and decay rapidly, even more so in a hydro unit. With hydro I recommend putting the flavoring in the water between 1 and 3 hours before harvest. This rule isn't set in stone but I heard from one grower who used a sugar based clearing solution on his crop and less than 24 hours later the water was foaming from bacteria growth. Plants draw up solution fairly quickly so one hour should be enough for some of the flavoring to reach the top. Three hours should not be enough time for bacteria to grow but you will want to dump out the solution right afterwards and clean out your unit. If you read the SU of Mar 27 you knew to use plain water for a few days before harvesting your hydro crop so all that will be in the water will be the flavoring.

If you are a soil grower it's even easier. You might think it would take longer for the flavor to work its way through the plant but this is not the case. All you have to do is let the plant dry out a little before you apply the solution. In other words, schedule a watering just before harvest. Naturally you were giving your plants plain water for several days to a week or two before harvest. Give the plant the water with the flavor when it's a little bit thirsty and it will draw it right up. One hour is more than enough time for this to happen. After harvest it's important to give it a good cure. Resist the temptation to fast dry some of the weed to try it out. You will find it's even harsher than it would be normally because you have added some sugar to the plant by way of the flavoring. The curing process will take care of the extra sugar and give you nice mild smoke. It will also have the flavor and aroma you are looking for. I'm sure I will get a deluge of email asking me what the exact formula is for the flavoring. I can hear it now "how many drops of Bosco per gallon?" First of all, I don't know what you want. You may want something that smells exactly like an orange or a blueberry and doesn't smell at all like pot. As far as I know that's not possible. You would probably ruin the pot if you succeeded. What some people think is a nice hint of strawberry may be way too strong to the next person. What one grower thinks is very blueberry may not smell or taste like blueberry to his friend. I suggest that you don't treat your whole crop this way while you are experimenting. Dirt growers will find this easy because they could use something different in each pot. Hydro people may want to isolate a plant or two with the solution. This wouldn't be very hard because you wouldn't need circulation for the short period of time it would be soaking in it. Other things you could try are guava, pineapple, grapefruit, passion fruit, cherry, mint or even pina-colada. Stronger and more concentrated flavorings will have a more pronounced effect than more dilute products. You may need gallons of orange juice to get what you want but a half ounce of concentrated strawberry essence might do the job nicely. I may start collecting recipes and have an issue of the SU devoted to peoples' favorite recipes sometime in the future. In short, experiment and see what works for you. The other approach is to use something in the curing process. People have had good results with orange peel, lemon peel or other citrus peels. This will only give a bit of odor, it's not as strong a technique as the previous one I mentioned. For those who just want a hint of something this may work fine. It's important to watch very closely for mold when curing. The moisture from the peels may promote mold if you're not careful. Let the herb dry for a day or two before you add the peels This might work a little bit with pot that's already cured and dried but it's less effective at that point.

Make The Medicine

<http://phoenixtears.ca/make-the-medicine/>

For those of you who have watched the documentary “Run from the Cure”, this should answer any questions about producing your own oil. I recommend that people grow their own hemp either in a small indoor grow system or outdoors. Growing it yourself will eliminate the high cost associated with buying hemp from drug dealers. The cost of hemp can vary greatly from dealer to dealer and so can the quality of the hemp. For anyone new to growing hemp a good book or video on the subject is a necessity. If you go to Cannabis Culture, the good people there should be able to point you in the right direction.

Caution: Oils that drug dealers sell can have many contaminants and often little or no THC. From my experience, most hemp oil available on the street should be avoided for medicinal use. Make your own oil or have someone you trust produce the oil to assure a very pure, high quality oil is produced.

How much to make and take?

One pound (500g) of bone-dry hemp buds will usually produce about 2 ounces (55 – 60 mL) of high-grade oil. This amount of oil will cure most serious cancers; the average person can ingest this amount in about three months. This oil is very potent so one must begin treatment with small doses. A drop of oil about half the size of a grain of rice, two to four times a day is a good beginning. After four or five days, start increasing your daily dosage very gradually. As time goes on the body builds a tolerance to the oil and more and more can be taken. In cases where people are in a great deal of pain, I recommend that their dosage be quickly increased until it kills the pain. High quality hemp oil will stop pain even when morphine is not effective. The oil can be applied to external injuries for pain relief in minutes.

Will I get high?

Following the dosage previously described, many people can take the full treatment and never get high. In regards to hemp, getting “high” is a joke, even if a person does take too much oil the effect wears off quickly and no harm is done. No one has ever died from the use of hemp medicine.

Will I become addicted?

Hemp oil does not cause your body to crave more. It is non-addictive, harmless and effective for practically any medical condition.

Is this the same as hemp seed oil?

No! This is hemp oil, made from the bud and small leaves of the hemp plant. It is the essential oil of the hemp plant. Health food store sells oil made from hemp seed that is often mislabeled as hemp oil. Although seed oil is very beneficial, it does not contain enough THC to have any effect on cancer and other serious illnesses.

Are hemp and marijuana the same?

The word marijuana is one of over four hundred slang terms used worldwide to describe the cannabis and/or hemp plant.

Are all hemp plants the same?

When buying or growing hemp, procure a strain that has the highest possible THC content. To energize someone suffering from depression, I recommend a good Sativa strain. For most other medical conditions, I strongly suggest that Indica strains be used. Indicas relax a person and provide them with more rest and sleep.

How do I use it?

High quality hemp oil can be vaporized, ingested or used topically. Add the oil to creams and salves for external use.

Where can I get information about making the oil?

For someone new to making the oil I suggest that you go to “Run From The Cure”. There you can watch our documentary in seven segments. Segment #4 shows how the oil can be produced at home or one can go to Phoenix Tears Movie and download the full documentary. You will need a high-speed internet connection and there is no charge. The process in the video could only be described as crude at best, but the oil that is produced will cure cancer. In reality, this medicine should be produced in a controlled environment, using distilling equipment, etc. to reclaim the solvent and to purify the oil. Most people do not understand distilling and do not have access to the required equipment. This is the reason such a simple method is described in the documentary, so if need be just about anyone can produce the oil. As in the video, again we stress that this process, if not done properly can be dangerous and we bear no responsibility if this educational information is misused.

My process:

Starting material: I generally work with a pound or more of good grade hemp starting material. You can use just one ounce. An ounce will usually produce 3 or 4 grams of oil. The amount of oil produced per ounce of hemp will vary from strain to strain, but it all has that wonderful healing power.

1. Place the completely dry starting material in a plastic bucket.
2. Dampen the material with the solvent you are using. Many solvents can be used. I like to use pure naphtha but it costs \$500 for a 45-gallon drum. You can use 99% isopropyl alcohol, which you can find in your local drug stores. Alcohol absorbs more chlorophyll from the plant material than naphtha does. This gives oils made with alcohol a darker color but does not diminish the potency of the oil to any noticeable degree. Ether, naphtha or butane and many other solvents can produce oils that are amber and transparent. Granted these clear oils do look better but dark oil can be just as potent. If the process is done properly, little or no solvent residue is left in the oil. I have been consuming oils produced using different solvents for eight years with no harmful effects. You will require about two gallons of solvent to strip the THC off one pound

- of dry starting material. 500 milliliters of solvent should be more than enough to strip the THC from one ounce of hemp starting material.
3. Crush the plant material using a stick of clean untreated (chemical free) wood or some such device. Even though the starting material has been dampened with the solvent, you will find that the material can be readily crushed.
 4. Add solvent until the starting material is completely covered. Use the stick to work the plant material. As you are doing this, the THC dissolves off the plant material into the solvent.
 5. Continue this process for about 3 minutes.
 6. Pour the solvent-oil mix off the plant material into another bucket. You have just stripped the plant material of about 80% of its THC.
 7. Second wash – again add solvent to the plant material and work it for another 3 minutes to get the other 20%.
 8. Pour this solvent-oil mix into the bucket containing the first mix that was poured off previously.
 9. Discard the twice-washed plant material.
 10. Pour the solvent-oil mix through a coffee filter into a clean container.
 11. Boil the solvent off. I have found that a rice cooker will do this boil off very nicely. The one I have has two heat settings – high and low – and will hold over a half gallon (2.5 liters) of solvent-oil mix.
 12. Add solvent-oil mix to the rice cooker until it is about $\frac{3}{4}$ full. **Make sure you are in a very well ventilated area and set up a fan to carry the solvent fumes away. The fumes are very flammable. Be sure to stay away from red-hot elements, sparks, cigarettes etc. that could ignite the fumes.**
 13. Plug the rice cooker in and set it on high heat.
 14. Continue adding solvent-oil mix as the level in the rice cooker decreases until it is all in the cooker.
 15. Add a few drops of water to the solvent-oil mix as the level comes down for the last time. The amount of water added depends on how much starting material you had in the beginning. If I am producing oil from a pound of good bud, I usually add about ten drops of water.
 16. When there is about one inch of solvent-oil-water mix left in the cooker, put on your oven mitts, pick the unit up and gently swirl the contents.
 17. Continue swirling until the solvent has been evaporated off. The few drops of water help release the solvent residue and protect the oil somewhat from too much heat. When the solvent has been boiled off, the cooker that I use automatically goes to low heat. This avoids any danger of overheating the oil. At no time should the temperature of the oil go over 290F degrees (140 C).
 18. Put on your oven mitts and remove the pot containing the oil from the rice cooker.
 19. Gently pour the oil into a small stainless steel container.
 20. Place this container in a dehydrator or put in on a gentle heating device such as a coffee warmer. It may take a few hours but the water and volatile turpines will be evaporated from the oil. When there is no longer any activity on the surface of the oil the medicine is ready for use.

21. Pour the hot oil into a bottle; or as in the video suck it up into a plastic syringe. Putting the oil in a plastic syringe makes it very easy to dispense the medicine.

When the oil cools off it has the consistency of thick grease. Some strains will produce very thick oil and you may have trouble squeezing it out of the syringe. If this happens, place the syringe in warm water a few minutes prior to use.

To anyone starting to use hemp oil as a medication, here are some simple facts. Hemp oil will lower blood pressure and if you are on blood pressure medication, you may find that this medication is no longer needed. The same is true for diabetics. I have seen hemp oil control blood sugar to the extent that insulin was no longer needed.

I am not a doctor and I do not have the right to tell people what they should do. Personally, I would not consider taking any cancer treatments currently in use by our medical system, I do not recommend that hemp oil be taken along with chemotherapy. What would be the sense of making your own cure and then allowing the medical system to give you massive doses of poison?

From my experience with hemp medicine, I have found that most pharmaceutical medications are no longer needed once a person starts using hemp oil. Hemp oil seems to mix well with most natural medications but I have had a few reports from people trying to take hemp oil and pharmaceuticals who experienced stomach pain etc. All problems ceased when they stopped taking the prescription drugs.

To anyone who is going to act on this information to help a loved one, I welcome you to the world of real medicine. Again, I caution you to be very careful when boiling the solvent off. The fumes are very flammable. Be sure to stay away from red-hot elements, sparks, cigarettes etc. that could ignite the fumes.

I wish you the best luck and health.

Warmest regards,
Rick Simpson

What is 'hash oil'?

It's a thick black oil made from hash. The hash is heated and pressed to release the oil. (Same process used to make hash from marijuana, but carried to an extreme.) It's almost like a tar; very sticky, very thick. How is it used? I've never seen it in the US, but when I lived in England, some 10 years ago, it was occasionally available. It came in two forms; sometimes it would be in a little plastic vial. Other times it would come in a piece of aluminum foil. From what I recall, the point was not to burn it, as that would burn off the active ingredients; but you wanted to inhale the vapor from it. The usual procedure was to get some heat resistant tube; the favorite was a thin clear plastic tube that is the body of a Bic disposable pen. Pull out the end cap, and pull out the ink/ballpoint thingy. Result: a clear plastic tube. Then, smear a small amount of the oil on a piece of aluminum foil. Hold the foil with pliers. With the oil on top, heat from beneath with a lighter. Hold the end of the tube above the patch of oil. As you begin to apply heat, suck like hell. The pliers (or something) are necessary because foil is an excellent conductor of heat, and you can burn yourself. It may take several heatings to use up all the oil from a smear. (You'll note this takes three hands!) For a nicer piece of equipment, take an old tablespoon. Bend the handle so that the handle bends away from the bowl, and then back so that it is pointing up away from the bowl. Attach same pen tube to the handle so that it points down into the bowl of the spoon. Smear oil into bowl of spoon, and heat spoon from bottom. (This only takes two hands.) Another technique, if you roll your own cigarettes, is to smear a streak of oil on a cigarette paper, and then roll a cigarette with this paper.

Artical Separation

I grew up in England, and when I was in high school (pun intended? ;-) there, all we could ever get was hash. For some peculiar reason, no one ever thought to use pipes. So we had to roll cigarettes with roll-your-own tobacco, and put crumbs of hash in them. Sometimes, to avoid the tobacco, we'd use disassembled clove cigarettes, or herbs like tarragon. If you've never used hash, (which I've never seen in the US,) it comes as a brown-green brick, which is VERY hard. You warm a corner over a lighter to soften it, and break crumbs off of it. You can't roll j's with this stuff; it's solid. (Sometimes, good stuff is very dark in color, even black; this is usually very soft, and if squeezed, drops of hash oil may sweat out.) I don't seem to recall it being very common to find head shops where you could buy smoking equipment proper, but tobacco and rolling papers were very common. I don't think equipment was common, because I do remember a couple of pieces of homemade equipment; one friend of mine made a bong in his ceramics class. I made one with a thistle tube, cork, glass tubing, and Erlenmeyer flask from a chemistry set of mine.

What is 'hash oil'?

It's a thick black oil made from hash. The hash is heated and pressed to >release the oil. (Same process used to make hash from marijuana, but carried to an extreme.) It's almost like a tar; very sticky, very thick. No, make that very, Very, VERY sticky. Sticks to everything. Stays under your fingernails for weeks after you've tried everything imaginable to get it out (and you try everything imaginable because the milligram or so that's stuck there is worth some money). It ruins clothes; the only thing that will take it off your skin or countertops is denatured alcohol or a similar solvent. The stickiest shit I have ever seen.

How is it [hash oil] used?

It turns up at dead shows occasionally. A "friend" had some that came from Jamaica, which is where he assumes it was made. "Friend" says the smoke is better than the vapor. The usual procedure was to get some heat resistant tube; the favorite was a clear plastic tube that is the body of a Bic disposable pen. Pull out the end cap, and pull out the ink/ballpoint thingy. Result: a clear plastic tube. Then, smear a small amount of the oil on a piece of aluminum foil. Hold the foil with pliers. With the oil on top, heat from beneath with a lighter. Hold the end of the tube above the patch of oil. As you begin to apply heat, suck like hell. The pliers (or something) are necessary because foil is an excellent conductor of heat, and you can burn yourself. It may take several heatings to use up all the oil from a smear. (You'll note this takes three hands!) Don't use a ballpoint pen unless you like to waste money (oil, same difference). This stuff costs a fortune--"friend" says \$35/gram when you can get it. It's really not worth it at that price. Anyway, as far as heating it vs. warming it, "friend" says he's tried it both ways. Both ways it's real, real hard on your throat (worse than the harshest weed--almost as bad as that "black Moroccan" lettuce O shit). It's a little harsher if you do the vapor thing. "Friend" says seems to be more effective smoked, plus you waste less. Best vapor method: put an old knife on a stove burner ("friend" used an electric stove; use a gas job at your own risk). Let it get nice and hot (red hot isn't too hot, but of course you don't want to deform the knife...). Get a paper towel tube or similar-size tube. **GATHER EVERYONE AROUND CLOSE.** Use a real thin screwdriver or similar instrument to get a little dab of oil, stand ready with the tube, and press the screwdriver against the hot blade and suck. Don't take too much; it's got incredible expando properties. The stuff will smoke uncontrollably till it's gone, so make sure everyone gets in their suck without letting too much go to waste (it's good if everyone has their own tube). The aluminum foil method is okay, but "friend" thinks it's a little more wasteful. Eventually ya got to throw that foil out. "Friend" says best way to do it is to roll it with some herb (tobacco kills). Another good way to smoke it (according to friend) is to line a screened bowl with rolling paper or leaf and put a drop in there. However you do it, take **SMALL** hits. The shit is lethal on your lungs. Actually, now that friend thinks about it, the best way to do it is to put about 10 grams in a 13x7" brownie pan with your favorite brownie recipe. Cut into ~1.25" squares. Eat one and have a wonderful night (sex is highly recommended). Eat two and become part of your favorite couch for 5 hours or so. Eat 5 or 6 and find out what heroin's like without having to mess with needles. Of course \$350 is a hell of an expensive pan of brownies.

I always found that hash oil was much stonier than hash. (Whatever that means...) It gave me more of that feeling in my eyes of being in a smoky >room when I was stoned on plain hash or MJ leaves. Friend likes good hash better. Easier to smoke, tastes better. Right about the buzz though. **VERY** intensely relaxing, almost paralyzing.

Of course, this was all long ago, and I don't do that sort of thing anymore.... Of course, neither does friend.:^) A word of advice (from friend): **BE CAREFUL** when buying this shit. It's real, real easy to get ripped off, and doling out \$35 for a gram of roofing tar is quite a bummer. Is hash oil mentioned in an FAQ? I'm too lazy to look. If it's not it should be. Oh, friend tells me to add one more thing: heating up the vial will make the stuff a lot easier to deal with (liquefies it). Also makes it more prone to spillage, so take great care when handling it in its liquid form. You can heat the vial with a lighter or put it on an electric stove burner. God, my friend is such a drug-craving un-American lowlife.

How to purify THC from leaves?

This comes from a friend of mine that doesn't have net access, so I won't be able to supply further details...

1. Run all leaf through a wire mesh sifter (such as a kitchen flour sifter)
2. Completely soak the leaf with ethyl or isopropyl alcohol for about 4 or 5 days
3. Strain resultant product through silk (used for silk-screening)
4. Evaporate remainder by applying very low heat from kitchen stove
 - Caution: be very careful - the product is **quite** flammable
5. After evaporating, there will be remaining "goo". This is the hash oil.

[It was noted in a follow-up that isopropyl alcohol is generally sold denatured, so that it's vile to drink. The chemicals which denature it, however, **should** get evaporated by step 4, and further combusted when you smoke it. Therefore the effect of these chemicals **should** be minimal, but since I don't have the foggiest idea of what the chemicals actually are, use at your own risk -- Lamont]

How to purify THC from leaves?

Above steps.

Use acetone instead of alcohol. THC is SUPER soluble in acetone - soak the ground-up leaves in acetone, then distil it off. Best purity from any solvent I've ever tried. Next best choice is petroleum ether. Seriously, alcohols are too H₂O - soluble for really good purity - lots of other nonpsychoactive stuff gets in the oil.

P.S. once you've got the oil, it's REALLY sticky & hard to handle. Mix with 2 parts powdered leaf to form good hash. You're welcome.

THC-Resin Extraction

Since so much time, labour, and cost has gone into the production of each plant, growers do not overlook utilization of the "shake" or leaves. Extraction involves the process of removing the essential oil, THC resin, from the leaves remaining on the plant and those removed during pruning. This is accomplished through the use of a solvent in which the oil will dissolve, which is later separated from the plant material by passing it through an appropriate filter. The best solvent found to date is chloroform. It is non-flammable, which makes it safer to handle than ethanol. Further, it has a low boiling point (61 C., 142 F.), and a residue after evaporation of .0005 percent. This low residue percentage means that virtually no trace solvent remains to contaminate the oil and cause an aftertaste, which is usually a problem encountered with ethanol unless time-consuming distillation processes are used. Another important concern is that chlorophyll is relatively insoluble in chloroform, eliminating the heavy "green" taste that always results from ethanol extractions. To initiate the extraction process, the leaves must be dried thoroughly. This can be done by placing them on fairly absorbent paper, such as newsprint, in a good sunny spot near a window. (Fresh newsprint paper can be obtained in most art supply stores. The lead content of ordinary newspapers makes them unsuitable for this purpose.) The leaves are then turned over every few days to ensure complete drying. When they are sufficiently and completely dried, the leaves should be brittle and crumble easily between the fingers. They are then placed in a blender or food processor and ground to a fine powder. Studies have shown that to achieve 90 percent extraction of the oil, the plant material must be powdered. ["Studies"?! Don't ask... -ed.] This is because nearly as much oil is contained in non-glandular internal tissues as is produced by the glandular tri-chomes. Next, a filter (a coffee filter will do) is placed over a clean Pyrex beaker or Corning Ware dish. The plant material is piled about halfway to the top of the filter, and the rest of the material (if any) is saved in an air-tight container. Pour approximately 200 ml of chloroform into the blender or food processor and slosh it around the sides. This rinses out any oil that may have adhered to the container's walls. Chloroform is poured from the blending container over the plant material until it reaches the top of the filter (adding more chloroform if needed). When the chloroform has completely filtered in to the beaker or dish, this process is repeated by adding chloroform until it again reaches the top of the filter. Two extractions of the same plant material are usually sufficient to remove all of its THC oil. The plant material is discarded; the same procedure is repeated until the beaker or dish becomes full of solvent. Now the beaker or dish is placed on an electric stove or hot plate and heated slowly to a very low boil. When the chloroform is being evaporated, the area must be completely ventilated! In the early days of medicine, chloroform was used as an anaesthetic until harmful side effects [such as liver damage! -ed.] were discovered, so it is clear that extreme care must be used when evaporating this solvent. After the solvent has been evaporated, the same procedure is repeated until all of the plant material has been treated. The oil is collected and stored in a glass pipette. These can be obtained at a scientific supply and are inexpensive. The oil is drawn into the tube (this may be easier if the oil is first heated a bit), and the tube capped at both ends. Resin is best stored inside airtight containers and in an area of low light and humidity.

MAKE AND TOKE YOUR OWN BONGS!

==> Remember, there's more to marijuana than just smoking pot.

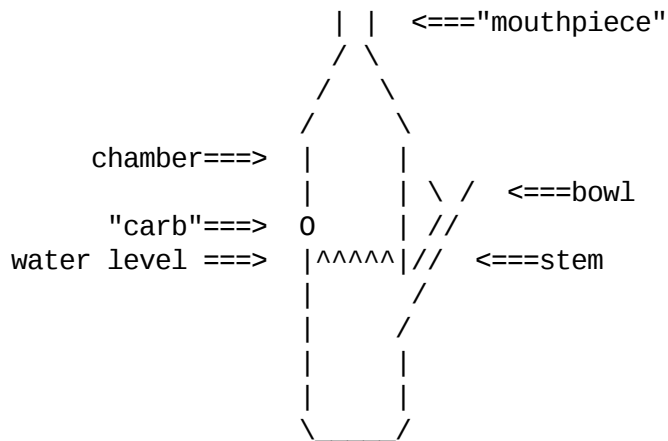
Why Bongs? / The Bong Concept

Making a bong is very simple, because the concept of a bong is simple. When you toke, you are bubbling the smoke through water before inhaling it. This text phile will take you through various aspects of bongs and bong-making. I hope you will find it valuable and I hope it inspires you to make your own bongs.

The reason for using a bong is mostly for health reasons, though people love using bongs for many more reasons. The active part of marijuana, THC, is **not** water-soluble, so you will not lose any of your high by hitting a bong instead of a joint or pipe. The water does filter out many of the impurities (the resinous tar), thus saving your lungs from inhaling crud. Very hot water will remove the most impurities, and very cold water will cool the smoke for a smoother hit.

(THC-delta-9 tetrahydrocannabinol.)

The anatomy of a conventional bong is **very** simple. It consists of a bowl (with a screen), a stem, a chamber, some liquid, and an opening for the mouth.



The crude diagram above shows a generic bong. All you need for a simple bong is a plastic pop bottle (12-ounce or larger recommended), some kind of stem (a metal tube, plastic tubing, or whatever), and a bowl (use aluminium foil if you can't find anything else). I suggest investing in a tube of silicone--it's the best sealant for plastic, and satisfactory for metal-plastic seals.

After you have constructed the bong and let the sealant cure, don't forget to drill (knife) a 1/4" hole for the carb (short for "carburettor", I guess). Water fills the container and stem just up to the carb. The water level should really be at least an inch below the carb so that when the bong is tilted the water won't leak. The job of the carb is to regulate where the air will be supplied from. If covered, the air (smoke) will come from the burning weed; if uncovered, air will be pulled in through the carb to force out the standing smoke from the chamber.

Do a "water test" before you pack a bowl. Pull a lungful through the bong with the carb covered. If you get a biting, chemical flavour, then you have not let the silicone cure long enough--it's toxic to inhale until it's fully cured--then it's harmless. The water test will also let you determine how airtight your bong feels.

Smoking a conventional bong means that you have water in your bong, you have a packed bowl, and a lighter. Cover the carb with your thumb and light the bowl and pull air through the bong until you get a steady bubbling of smoke through the water. When your lungs start to hurt a little, let go of the carb and gently pull in the trapped smoke. If your lungs feel fine as you inhale, then save a little lung space for the trapped smoke--let go of the carb and pull it in!

Not all bongs work with this method, however. Gravity bongs work on a different concept, which will be explained later.

Bongs vs. Joints & Pipes

Not everyone uses bongs. New smokers may wonder why anyone bothers with bongs, and I know plenty of stoners who **prefer** joints to pipes or bongs.

Those who favour joints will wax romantic about the joys of rolling, of passing around a fatty, and of super-potent roaches. While I will not turn down a joint making its way around a room, I have never rolled one myself. I disdain joints mainly because of their wastefulness. Consider: While the joint is being passed around or stalled, it is still burning, losing precious smoke. If you grow your own buds you can afford to be carefree, but that is a luxury. Most stoners must pay astronomical street prices for what is just a WEED.

Bongs have a special advantage. A stoner can control the burning by using the flat side of a lighter to extinguish the bowl after taking a hit. The practice of extinguishing the bowl can save a lot of pot in the long run.

Even those who don't habitually extinguish the bowl will still save more buds, considering the size of a bowl compared with a joint. A bowl holds a smaller amount of bud, so the most you can waste is the quantity a bowl will hold. Stalling a joint, though, will use up a much larger portion, depending on the size of the joint.

Joints are **much** harsher on your lungs. While some joint-rollers will use pre-made filters, or a makeshift filter made from a rolled-up paper, nothing compares with the filtration effect of water. Ed Rosenthal of *_High Times_* has noted that water not only cools the smoke, but actually removes harmful impurities as well. Bongs have this advantage over pipes, which, like joints, pass the unfiltered smoke right into your lungs.

As far as portability goes, bongs can be made in a variety of sizes. I made myself a portable bong out of a 12-ounce plastic water bottle. It works fine, though the filtration leaves something to be desired. Nevertheless, I prefer it over my corn-cob pipes, which I never use anymore.

Considerations in Bong-Making

When planning a bong, one should aim for specific goals. Should the bong be portable? Fancy? Colourful? Here's a partial list of characteristics which give a bong its individual personality:

- Air tightness/ease of drawing smoke
- Bowl size
- Choice of chamber/tube(s)
- Compactness/portability
- Decoration
- Filtration
- Hit size
- Transparency
- Tube diameter
- User accommodation
- Volume
- Etc.

Air tightness

I will not discuss every possible characteristic of a bong, but I will stress that no matter what kind of bong you make, you should strive for air tightness. When in doubt, just dab and smooth some silicone around the joints where materials meet and leave gaps. An airtight bong means that you will not be wasting lungpower. This quality becomes progressively important with more chambers added to the bong, because there are more possible gaps.

Materials

While there's a wide variety of containers and materials you can use in making a bong, make sure they will be safe. **PVC IS OUT! DO NOT USE ANY TUBES MADE WITH POLYVINYL CHLORIDE BECAUSE THEY LEACH OUT CARCINOGENIC PARTICLES OVER TIME.** When deciding whether to use a certain kind of plastic or not, the rule of thumb is to make sure it's safe for food. If it's meant to store food, it's okay. Otherwise, don't risk it. Plastic tubing is fine. Glass is optimal because it's inert.

My friend's bong, "The Monster", is made from a 1-litre, heavy-duty Erlenmeyer flask with a two-hole stopper (+ stem & bowl) and a length of rubber tubing. It's simple, it's airtight, and you can watch the smoke fill the chamber while your friend is taking a hit.

Metals are fine to use, too. **STAY AWAY FROM COPPER BECAUSE IT LEACHES INTO THE SMOKE.** Stems and bowls made from aluminium and brass are the best. Stay away from any metal that could leach into the water, and especially stay away from lead (duh).

Clay is great for bongs. The same friend who owns The Monster had a buddy of his make him a small clay bong. It's only about 6" high, with a round chamber, a stout neck and a fixed bowl. It was not glazed or fired, but it's airtight and very portable, not to mention cute as shit.

More water = better filtration & harder pull

Being the health-nut stoner that I am, I have decided that filtration is the most important characteristic for my bongs to have. I figure that I'll be smoking buds all my life, and since I have asthma I want to be as kind to my lungs as possible.

The best filtrating bong I've ever smoked is my most recent creation--the triple-chambered bong. Yes, it is smooth as shit--I blow out huge clouds without feeling any irritation on my lungs. Do it yourself: use three Mickey's Malt Liquor (wide-mouth) bottles and some 1/4" clear plastic tubing (hardware store). I strung my bottles together in series, meaning that the bowl on the first one is connected to a stem (3/8" plastic tubing) that plunges down to the bottom. Another hole in the cap lets a second tube draw the smoke out of the first chamber and channel it to the bottom of the second bottle. The same thing again--another tube draws smoke out of the second chamber and pulls it down to the bottom of the third chamber. A fourth tube is the sipping tube to inhale the smoke from the third chamber.

The trade off is that it is a little harder to pull the smoke through this bong than through a standard Graphix, especially if all the bottles are more than half-filled with water. I sealed all the joints with silicone, so it's surprisingly tight and easy to pull, given the length of the draw and the weight of the water. The bonus is that I usually put boiling-hot water in the first chamber, with iced water in the second and third chambers. Don't try this with plastic chambers!

If filtration is not that important to you, just make sure the smoke bubbles up through at least a half-inch of water.

Liquids

If you like to experiment with bong design like I do, you may try using different liquids in your bong. Here are some things I've found: Carbonated liquids (seltzer, pop) really scrub the smoke well, because of the agitation of the bubbles. Different pop/juice flavours really don't do anything to the flavour of the smoke. Beer and hard liquor add excellent flavour to the smoke, but they cost hit power, since THC is soluble in alcohol. Chloraseptic (throat spray) will numb your throat as you smoke, eliminating all smoke irritation on your throat--kind of scary and I wouldn't advise it. Mouthwash covers the smoky taste with a great mint flavour, but I don't know what hazards it holds--again, not recommended.

Hot water is excellent for scrubbing the smoke--use boiling water, if possible. The trade-off is that the heat of the steam can be more irritating than the heat of the smoke. At the right temperature the steam will soothe your throat by humidifying the smoke. Cold (ice) water is excellent for cooling the smoke and giving you great big bong hits that you thought impossible with your tender little lungs.

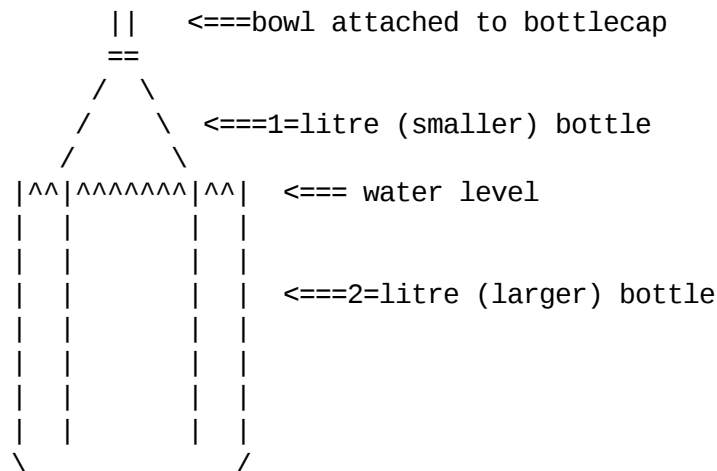
Aesthetics

My first phile was called "The Art of Making Bonges" for good reason. There is indeed an ART to it, and you should open up your creativity to your project. Impress yourself, and impress fellow stoners by using materials that please the eye as much as that killer skunkweed pleases your state of being. Sure you can make a quickie portable with a 12=ounce water bottle, but what about your home/party bong? Take the time to explore garage sales, flea markets, thrift stores, and basements to find some cool container that screams "BONG!" The rest is up to you.

I made a hookah (multi-user bong with sipping tubes) out of a brass "pitcher". I found it at a garage sale for \$4. The hinge for the lid was damaged, but I didn't need the lid anyway, so I threw it out. I thrust a stem and two thin (3/16") flexible plastic tubes down the top opening and sealed it up with silicone. I plugged the spout with silicone, and *voila*--a romantic, two-person hookah that is interesting to look at.

A couple buddies of mine had a plastic pig's head that was supposed to be a toy bank. Guess what they did with it.... They stuck a stem into the pig's mouth and widened the coin slot to make an excellent bong that has a large chamber for smoke.

Gravity Bong



Gravity bonging works on an entirely different principle than most of the bonging you'll see in your travels. They are very easy to make, are hard to fuck up, and give great hits with decent filtration. The quickest way is to use a 1-litre plastic pop bottle, a 2-litre plastic pop bottle, and a bowl. Drink or dump the pop, then slice the neck off the 2-litre and slice the bottom black part off the 1-litre. The 1-litre serves as the "top" which fits inside the "bottom" part, the 2-litre. Use a knife to carve a hole into the bottle cap of the 1-litre, and screw in the bowl. (Make sure it's airtight.)

A gravity bong works by using a vacuum to pull in the smoke. One you've filled your 2-litre to the top edge with water, and inserted the 1-litre, THEN screw on the bowl and pack it. Light the bowl and SLOWLY pull the 1-litre up to create a vacuum that steadily pulls in the smoke. Make sure you don't pull the 1-litre all the way out of the water, because that will destroy the vacuum and you will lose your smoke. When you've pulled up all the way, unscrew the bottle cap and wrap your lips around the top. Let go (don't push)--the pressure of the smoke and gravity will pull the 1-litre down, pushing the smoke out and into your lungs.

I still don't know how it works, but there is some filtration effect with gravity bongs. Try using water with a lot of ice.

Notice that the 2-litre component can be any large body of water--a pot, a bathtub, a river, a lake....

Clean your screen!

***Quick tip: After finishing a bowl, dump the ashes, then purse your lips and blow a quick lungful through the bottom of the bowl to refresh the screen. You can hold the bowl up to the light to see if it's clean or not. Too many stoners will pack bowl after bowl without blowing out the screen--after a few bowls your hits will feel like trying to suck a golf ball through a garden hose.

Scraping Your Bong

After a lot of use your bowl and stem will get caked with resin (tar). Besides clogging up the bong's works like arteriosclerosis, the build-up of resin will be partially smoked every time you hit a bowl. The idea of bongs is to save your lungs from that tar crap, but if you are desperate for a high and you're out of bud, you can always smoke that resin after you scrape it out.

When scraping your bowl and stem, you should use a thin, narrow metal object. The awl attachment on a pocketknife works well. I've heard of stoners using an unbent coat hanger, although I prefer a jeweller's screwdriver.

I recommend throwing out the resin, but if you want to smoke it, it will give a powerful hit, similar to hash. The best thing to do is to save some leftover ash, then scrape your bowl. The flakes of resin that come off are very sticky and are hard to roll without smearing them all over your fingers. Resin smells very strongly, too, and won't come off your fingers for a few days. If you roll the resin with the ash, the ash acts as a binder and keeps the resin from sticking to your fingers excessively. After scraping the resin onto a smooth, flat surface, roll it with the ash into a ball. When done, stick it back into the bowl and smoke it.

Lighters

Lighters come in a variety of shapes and sizes. Ordinary cigarette lighters are adequate for smoking bud, but they're not the best. If ordinary lighters are used, it's best to make sure the flame is at least 1.5" tall. When lighting, the lighter is best held as vertically as possible, with the flame being sucked over the edge of the bowl onto the bud. This method avoids singed fingers.

If the flame doesn't get tall enough, here's a trick to really kick it up: The flame-height slide is really a tiny wrench that turns a tiny gear. Pull the metal guard so it's wider, then remove it. Now lift that slide up and out of the gear, then move it to the left and plop it back down into the gear. Now you can turn the gear even more to the right for a higher flame.

My lighter of choice is the barbecue lighter. It's red and white and has a 4-inch square barrel that extends away from the trigger. Yes, it's overkill, but it has everything I look for in a bong lighter: big flame, safe finger position, no flints (it's piezoelectric), and refillable butane tank.

If you can't find the barbecue lighter, try to find a pipe lighter. Pipe lighters emit a tall flame at a 90- or 45-degree angle, making it easier to light a bowl.

If you're using a regular disposable lighter, keep your fingers safe by holding the bottom with your middle finger and flicking the roller with your thumb.

Above all else, though, the most important characteristic to look for in a lighter is reliability. It's depressing to be holding a packed bong, ready for a hit, and flicking the lighter over and over without getting a flame.

Wetting the herb

Some time ago a stoner wrote in to *_High Times_* that he gets more smoke (up to three times as much) from his bud when he wets the herb.

I used to be sceptical of this claim, but now I wet the bud whenever possible. I think it not only makes the bud burn more efficiently, but it also dampens the harshness of the smoke. Try your own tests....

Etiquette

Disclaimer This section on etiquette is meant to be a *personal* observation of stoner manners. I do not mean to imply that this is how stoners, as a whole, do or should conduct their smoking.

Bong etiquette seems to allow each person one lungful (inhalation) per turn. Everyone should get a good hit before they pass it on. The toker is also allowed to finish the chamber of smoke (carbed) on a second breath. If a person doesn't get a good amount of smoke in a hit because of a cashed bowl, they're allowed to smoke first (if going in order) from the new bowl.

The bong *and* lighter should be smoothly passed onto the next stoner. The veteran stoner will extinguish the bowl so that no bud is wasted for the next person.

Etiquette for the host suggests that s/he provide his/her guests with a spittoon (garbage can), water/drinks, and munchies (optional, but very generous!). Needless to say, the ambience should be comfortable and inviting. Bud is best enjoyed in company and with entertainment, so bud should be shared with friends.

Bowl packers are subject to a much looser constraints. It's hard to argue with the rules of the person packing bowls, since s/he is basically doing everyone else a favour. Bowl packers can be dictators and direct the route of the bong. They can also smoke as much of their own bud as they want, even if they're out of turn. The kindest bowl packers pack so much bud into a large bowl that the air can barely be sucked through it. They pass the bong around in order and re-pack the bowl liberally. Not everyone has the money to afford this philosophy, but stoners are usually generous people.

Usually the person packing bowls will take the first hit off a new bowl, but not always. It is a generous gesture when the bowl-packer first passes a fresh bowl to someone else.

A wise bowl-packer will know that quantity is not quality. The law of diminishing returns means that after a few good hits additional hits will just waste pot and put people to sleep. Wait awhile and then offer a "refresher" bong hit once everyone's buzz starts to wear off.

While stoners can be obnoxious, they are all too often labelled as "bad stoners". This unfairly derisive term means that a stoner acts goofy while stoned. It's very uncool to blame some stoner's goofy behaviour on the fact that s/he's stoned because it's too easy to make a stoner self-conscious (and that sucks). It is more polite to allow everyone to enjoy the bud in their own way and not be judgmental of others.

The best attitude to have is to relax and enjoy the company and the surroundings. Bud is finicky that way--every experienced stoner knows that you should be in a good mood when stoning.

Conclusion

I hope this article will be informative and useful to some stoners. I have tried to tighten it up, make it more readable, and remove blathering sections from the previous version.

In closing I urge all stoners to realize that there is no reason for marijuana/hemp to be illegal. Mainstream drugs like alcohol and nicotine are much more dangerous.

If marijuana is ever to be legal, it will require that stoners come out of the closet and talk openly about the benefits of pot smoking with **everyone**. Tell non-stoning friends, relatives, colleagues, co-workers, teachers, parents, etc., as much as possible. Be informed and answer questions honestly. Although it can be difficult to tell people you've known all your life that you smoke pot and think it should be legalized, it is easier than you think. If you follow up your admission with good arguments, your friends (etc.) will be forced to seriously wonder why marijuana is illegal at all.

Get organized and HAPPY STONING!

The Legalization of Cannabis: Applications and Benefits

Clint I.Q.

February 28, 2006

The Legalization of Cannabis: Applications and Benefits

Cannabis and humans have shared a long history together. The first known evidence of the use of cannabis in a human culture is from the Middle East and originates almost 6,500 years ago. The cannabis plant is useful in all its varieties and can be used in its flowered form to relieve chronic pain. There is no question that the use and exploration of the cannabis plant should be legalized because of the plants many beneficial applications. The various beneficial aspects of the plant are its medical uses, its industrial usage, and its use in agriculture, but all must first be met with knowledge of the nature of cannabis' psychoactive properties.

Cannabis is known foremost for its psychoactive properties. "Of all plants, it [cannabis] is the only genus known to produce chemical substances known as cannabinoids. The cannabinoids are the psychoactive ingredient of marijuana; they are what gets them high." (Frank 21) It should be noted that from this point the terms cannabis and marijuana will be used interchangeably. This is also what made its use so prolific in ancient times; the high was considered to be a gift from God. Currently, due to its status as a Class 1 narcotic, the cannabis plant is primarily cultivated for this reason alone. In order to agree that the plant should be legalized, one must understand the experience while high, the dangers inherent as well as the benefits.

The experience that a user of cannabis experiences after smoking the flowered tops of the plant is extremely euphoric. The intensity of the high is directly proportional to the amount ingested; however, the effects at low doses can range from a sense of well-being to talkativeness and appreciation of music. In high dosages, hallucinations may occur, along with a distortion of your perception of time. The effects of inhaling cannabis are extremely

safe, for the most part. Unlike alcohol, for example, there have been no known overdoses from cannabis, although users of the plant may experience mild to extreme discomfort if they ingest too much for their tolerance level. The government's main reason to make the cannabis plant illegal was due to its addictive properties. In the 1936 film *Reefer Madness*, marijuana cigarettes were portrayed as being more harmful than normal cigarettes, more addictive even than heroin. However, most medical studies have shown marijuana's addictive potential is merely psychological. In other words, there is no physical addiction, but you can get hooked psychologically. This can be compared to a person who cannot stop eating candy bars. They are considered to be addicted, but there are no physical symptoms. One of the truly valid points that the opponents of the legalization of cannabis make is that the smoke is carcinogenic. However, it is common knowledge that the cannabis plant can be cooked or mixed with alcohol to remove the active ingredients, making it possible to ingest the active substances without the carcinogenic effects of smoking. Since 1975, researchers have been able to isolate the cannabinoids in marijuana, and recently doctors have been prescribing pills known as Sativex, which give users the same effects as smoking the plant. These alternatives to smoking bode well for the medical future of the plant, allowing users to experience the pain-numbing effects without having to smoke.

The medical potential of the cannabis plant is phenomenal. In a statement by Mel Frank, one of the world's foremost leaders on the use of the cannabis plant, he says "The *Pén-ts'ao Ching*, [the oldest pharmacopoeia known] prescribes marijuana preparations for malaria, beriberi, constipation, rheumatic pains, absent-mindedness, and female disorders." (Frank 7) Even the cannabis root can be ground up into a paste and applied to broken bones to relieve pain. Users of the plant also experience what's known as the munchies, which can

be useful to stimulate appetite. When ingested, it can also be used as a nausea suppressant. Because of all of the potential arguments for its legalization, the impact of the cannabis plant in today's medical and legal environment cannot go unmentioned.

Despite the plants many uses, it was illegalized in the United States during the year of 1914, by the Harrison Narcotic Act. Since then, its use in any aspect, including the medical profession, has been frowned upon by the U.S. Government. The only exception to this occurred during World War II, when the government planted fields of cannabis to supply naval rope needs. Today it remains a listed as a "Schedule 1 Drug, defined as having 'No acceptable Medical use in treatment in the United States.' This remains the case, but in 1973 Oregon decriminalized the possession of small amounts of marijuana; since then, 10 other states have followed suit, making the penalty for possession of small amounts of marijuana equivalent to that of a minor parking ticket. This is one of the major hot-button topics, but as with all things, in order to make a fair and sound judgment on the subject, one must understand the potential uses and benefits. Support is growing. "The Virginia Nurses Association (VNA) has called for the legalization of Marijuana for medical use. One of the first nursing associations to put its support for the therapeutic use of *cannabis* on the public record, the VNA said it would continue to support legislation that would legalize the medically prescribed use of cannabis/marijuana for the purposes of relieving pain and distressful symptoms of acute, chronic, or incurable illness." (Virginia, ¶1) Even beyond the medical potential, one must also consider the industrial potential that the cannabis plant holds.

The potential industrial usages of the cannabis plant are astounding. The cannabis plant is known to be able to produce paper, textiles, building materials, medicine, paint,

varnish, oil, ink, and fuel for automotive vehicles. In fact, according to the North American Industrial Hemp Council, “over 25,000 products can be created from the cannabis plant.” One of the main draws for the employ of cannabis as an industrial agent is that the plant is naturally a weed and consequently can grow in almost any location and climate, with very little care. It is naturally resistant to bugs and mildew and extremely productive, when compared to an average forest. The NAIHC [North American Industrial Hemp Council] states “Hemp can yield 3-8 dry tons of fiber per acre. This is four times what an average forest can yield.” This fiber can then be pressed into clothing that is 50% more efficient at absorbing UV rays, or paper of very fine quality that will not yellow. The rainforest is being decimated? Replace it with cannabis. It will be at least as productive as the rainforest has been and cannabis grows much more rapidly than trees do.

The cannabis plant can also find its way into our kitchens. The plant’s seeds can be dried and salted, creating a vaguely sunflower seed-like taste and texture for a healthy snack. The oil that the seeds produce can be used for any cooking recipe that calls for oil. The oil can also be used for a delicious dressing or dip. It can be used to brew beer, and the remains from the process can be used as animal food. If the seeds are ground up, they can be pressed into flour that can then be used in any application that calls for flour as a nutritious ingredient.

With all of these potential applications, there seems to be no question that the use of this plant should be legalized. After all, it is even possible to grow the plant without its psychoactive chemicals, allowing it to be used industrially without the potential for user abuse. The materials that it produces are superior in countless ways to their counterparts and most importantly every single part of the plant can be used in a productive fashion. Cannabis

has the potential to be a billion-dollar a year crop, if we are only willing to experiment with its potential uses. The government could even step in and tax/regulate its production and use, as they do with alcohol, or perhaps pass the production of the plant on to the farming community. There is no question that the overall benefits of the legalization of the cannabis plant for medical, industrial, and agricultural reasons far outweigh the potential negativities, and as such Cannabis must be explored for potential usages.

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http://www.naihc.org/hemp_information/hemp_facts.html
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To use the Problem-Solver, simply start at #1 below. When you think you've found the problem, read the Nutrients section to learn more about it. Diagnose carefully before making major changes.

1) If the problem affects only the bottom or middle of the plant go to #2. b) If it affects only the top of the plant or the growing tips, skip to #10. If the problem seems to affect the entire plant equally, skip to #6.

2) Leaves are a uniform yellow or light green; leaves die & drop; growth is slow. Leaf margins are not curled-up noticeably. >> Nitrogen(N) deficiency. b) If not, go to #3.

3) Margins of the leaves are turned up, and the tips may be twisted. Leaves are yellowing (and may turn brown), but the veins remain somewhat green. >> Magnesium (Mg) deficiency. b) If not, go to #4.

4) Leaves are browning or yellowing. Yellow, brown, or necrotic (dead) patches, especially around the edges of the leaf, which may be curled. Plant may be too tall. >> Potassium (K) deficiency. b) If not, keep reading.

5) Leaves are dark green or red/purple. Stems and petioles may have purple & red on them. Leaves may turn yellow or curl under. Leaf may drop easily. Growth may be slow and leaves may be small. >> Phosphorus(P) deficiency. b) If not, go to #6.

6) Tips of leaves are yellow, brown, or dead. Plant otherwise looks healthy & green. Stems may be soft >> Over-fertilization (especially N), over-watering, damaged roots, or insufficient soil aeration (use more sand or perlite. Occasionally due to not enough N, P, or K. b) If not, go to #7.

7) Leaves are curled under like a ram's horn, and are dark green, gray, brown, or gold. >> Over-fertilization (too much N). b) If not, go to #8...

8) The plant is wilted, even though the soil is moist. >> Over-fertilization, soggy soil, damaged roots, disease; copper deficiency (very unlikely). b) If not, go to #9.

9) Plants won't flower, even though they get 12 hours of darkness for over 2 weeks. >> The night period is not completely dark. Too much nitrogen. Too much pruning or cloning. b) If not, go to #10...

10) Leaves are yellow or white, but the veins are mostly green. >> Iron (Fe) deficiency. b) If not, go to #11.

11) Leaves are light green or yellow beginning at the base, while the leaf margins remain green. Necrotic spots may be between veins. Leaves are not twisted. >> Manganese (Mn) deficiency. b) If not, #12.

12) Leaves are twisted. Otherwise, pretty much like #11. >> Zinc (Zn) deficiency. b) If

not, #13.

13) Leaves twist, then turn brown or die. >> The lights are too close to the plant. Rarely, a Calcium (Ca) or Boron (B) deficiency. b) If not... You may just have a weak plant.

The Nutrients:

Nitrogen - Plants need lots of N during vegging, but it's easy to overdo it. Added too much? Flush the soil with plain water. Soluble nitrogen (especially nitrate) is the form that's the most quickly available to the roots, while insoluble N (like urea) first needs to be broken down by microbes in the soil before the roots can absorb it. Avoid excessive ammonium nitrogen, which can interfere with other nutrients. Too much N delays flowering. Plants should be allowed to become N-deficient late in flowering for best flavor.

Magnesium - Mg-deficiency is pretty common since marijuana uses lots of it and many fertilizers don't have enough of it. Mg-deficiency is easily fixed with $\frac{1}{4}$ teaspoon/gallon of Epsom salts (first powdered and dissolved in some hot water) or foliar feed at $\frac{1}{2}$ teaspoon/quart. When mixing up soil, use 2 teaspoon dolomite lime per gallon of soil for Mg. Mg can get locked-up by too much Ca, Cl or ammonium nitrogen. Don't overdo Mg or you'll lock up other nutrients.

Potassium - Too much sodium (Na) displaces K, causing a K deficiency. Sources of high salinity are: baking soda (sodium bicarbonate "pH-up"), too much manure, and the use of water-softening filters (which should not be used). If the problem is Na, flush the soil. K can get locked up from too much Ca or ammonium nitrogen, and possibly cold weather.

Phosphorous - Some deficiency during flowering is normal, but too much shouldn't be tolerated. Red petioles and stems are a normal, genetic characteristic for many varieties, plus it can also be a co-symptom of N, K, and Mg-deficiencies, so red stems are not a foolproof sign of P-deficiency. Too much P can lead to iron deficiency.

Iron - Fe is unavailable to plants when the pH of the water or soil is too high. If deficient, lower the pH to about 6.5 (for rockwool, about 5.7), and check that you're not adding too much P, which can lock up Fe. Use iron that's chelated for maximum availability. Read your fertilizer's ingredients - chelated iron might read something like "iron EDTA". Too much Fe without adding enough P can cause a P-deficiency.

Manganese - Mn gets locked out when the pH is too high, and when there's too much iron. Use chelated Mn.

Zinc - Also gets locked out due to high pH. Zn, Fe, and Mn deficiencies often occur together, and are usually from a high pH. Don't overdo the micro-nutrients-lower the pH if that's the problem so the nutrients become available. Foliar feed if the plant looks real bad. Use chelated zinc.

Check Your Water - Crusty faucets and shower heads mean your water is "hard," usually due to too many minerals. Tap water with a TDS (total dissolved solids) level of more than around 200ppm (parts per million) is "hard" and should be looked into, especially if your plants have a chronic problem. Ask your water company for an analysis listing, which will usually list the pH, TDS, and mineral levels (as well as the pollutants, carcinogens, etc) for the tap water in your area. This is a common request, especially in this day and age, so it shouldn't raise an eyebrow. Regular water filters will not reduce a high TDS level, but the costlier reverse-osmosis units, distillers, and de-ionizers will. A digital TDS meter (or EC = electrical conductivity meter) is an incredibly useful tool for monitoring the nutrient levels of nutrient solution, and will pay for itself before you know it. They run about \$40 and up.

General Feeding Tips - Pot plants are very adaptable, but a general rule of thumb is to use more nitrogen & less phosphorous during the vegetative period, and the exact opposite during the flowering period. For the veg. period try a N:P:K ratio of about 10:7:8 (which of course is the same ratio as 20:14:16), and for flowering plants, 4:8:8. Check the pH after adding nutrients. If you use a reservoir, keep it circulating and change it every 2 weeks. A general guideline for TDS levels is as follows:
seedlings = 50-150 ppm; unrooted clones = 100-350 ppm; small plants = 400-800 ppm; large plants = 900-1800 ppm; last week of flowering = taper off to plain water. These numbers are just a guideline, and many factors can change the actual level the plants will need. Certain nutrients are "invisible" to TDS meters, especially organics, so use TDS level only as an estimate of actual nutrient levels. When in doubt about a new fertilizer, follow the fertilizer's directions for feeding tomatoes. Grow a few tomato or radish plants nearby for comparison.

pH - The pH of water after adding any nutrients should be around 5.9-6.5 (in rockwool, 5.5-6.1). Generally speaking, the micro-nutrients (Fe, Zn, Mn, Cu) get locked out at a high pH (alkaline) above 7.0, while the major nutrients (N, P, K, Mg) can be less available in acidic soil or water (below 5.0). Tap water is often too alkaline. Soils with lots of peat or other organic matter in them tend to get too acidic, which some dolomite lime will help fix. Soil test kits vary in accuracy, and generally the more you pay the better the accuracy. For the water, color-based pH test kits from aquarium stores are inexpensive, but inaccurate. Invest in a digital pH meter (\$40-80), preferably a waterproof one. You won't regret it.

Cold - Cold weather (below 50F/10C) can lock up phosphorous. Some varieties, like equatorial sativas, don't take well to cold weather. If you can keep the roots warmer, the plant will be able to take cooler temps than it otherwise could.

Heat - If the lights are too close to the plant, the tops may be curled, dry, and look burnt, mimicking a nutrient problem. Your hand should not feel hot after a minute when you hold it at the top of the plants. Raise the lights and/or aim a fan at the hot zone. Room temps should be kept under 85F (29C) -- or 90F (33) if you add additional CO₂.

Humidity - Thin, shriveled leaves can be from low humidity. 40-80 % is usually fine.

Mold and Fungus - Dark patchy areas on leaves and buds can be mold. Lower the humidity and increase the ventilation if mold is a problem. Remove any dead leaves, wherever they are. Keep your garden clean.

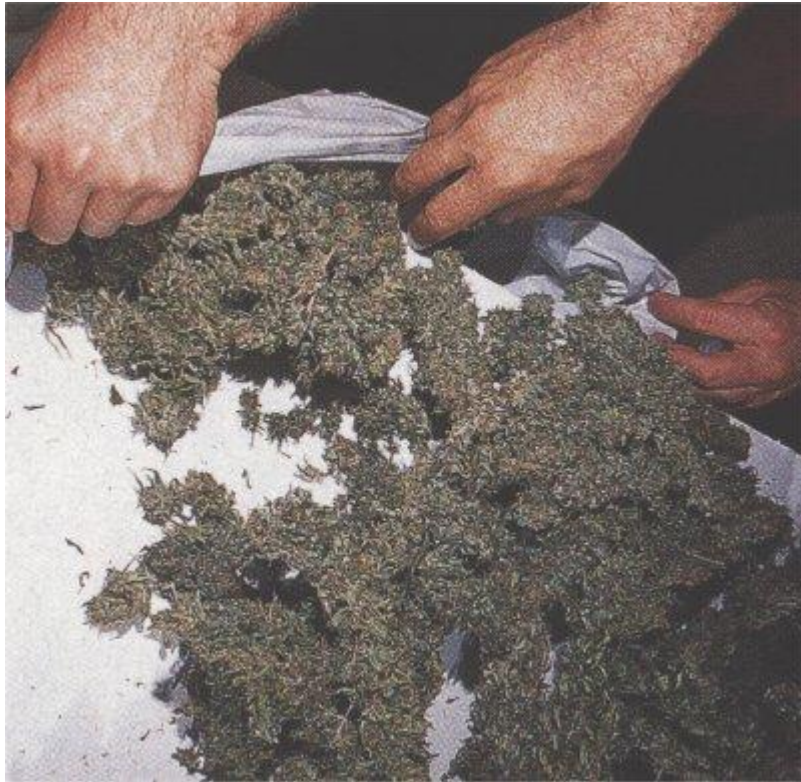
Insects - White spots on the tops of leaves can mean spider mites underneath.

Sprays - Foliar sprays can have a "magnifying glass" effect under bright lights, causing small white, yellow or burnt spots which can be confused with a nutrient problem. Some sprays can also cause chemical reactions.

Insufficient light - tall, stretching plants are usually from using the wrong kind of light.. Don't use regular incandescent bulbs ("grow bulbs") or halogens to grow cannabis. Invest in fluorescent lighting (good) or HID lighting (much better) which supply the high-intensity light that cannabis needs for good growth and tight buds. Even better, grow in sunlight.

Clones - yellowing leaves on unrooted clones can be from too much light, or the stem may not be firmly touching the rooting medium. Turn off any CO2 until they root. Too much fertilizer can shrivel or wilt clones - plain tap water is fine.

Harvest Highs

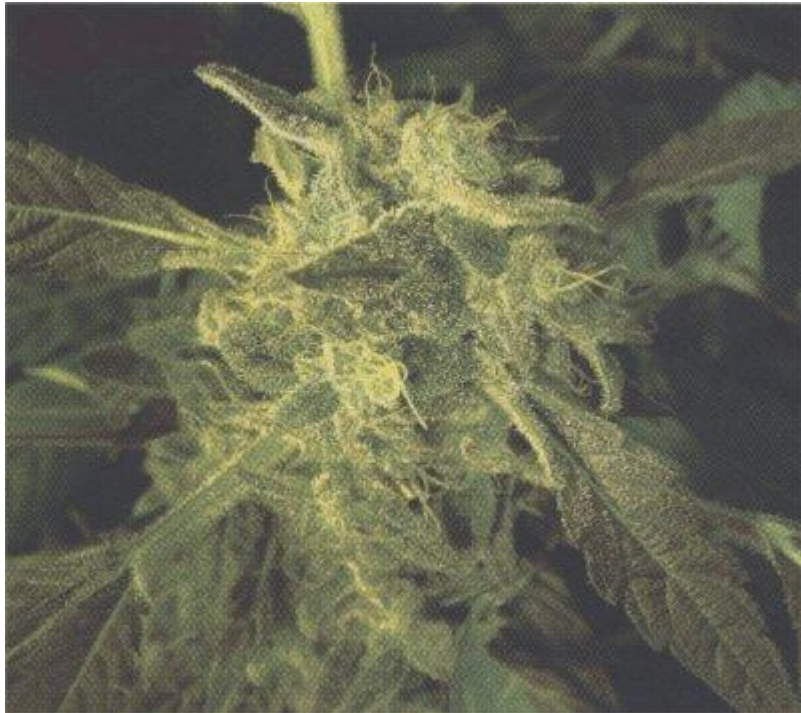


Many hours of work puts one pile in the bag.

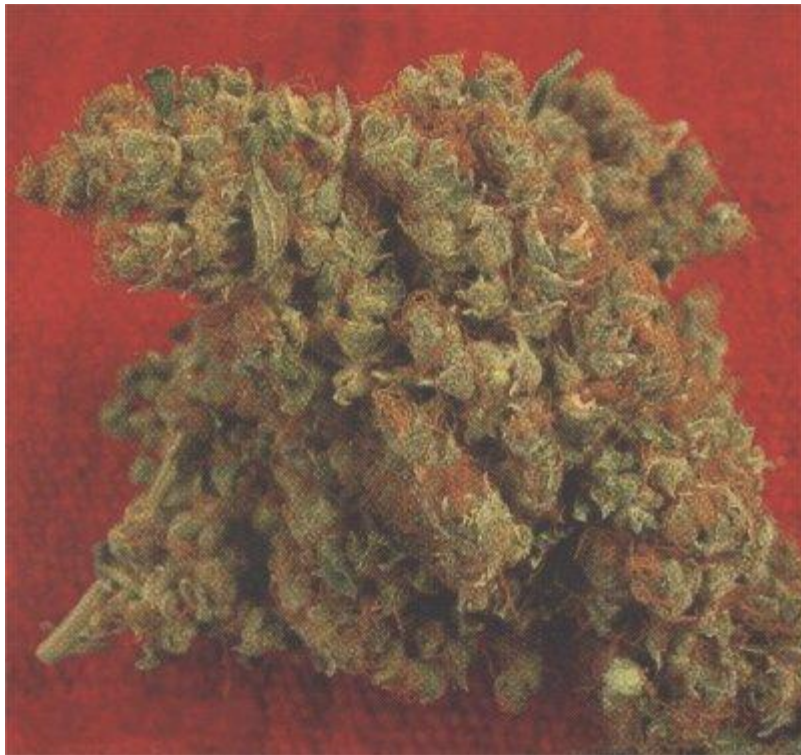
Determining peak ripeness is essential to harvesting. Once you cut your plants down there's still work to be done before they become that primo victory smoke you've been waiting three months for. Don't blow it at the last minute. Read on to learn the dos and don'ts of harvesting.

The HIGH TIMES guide to the connoisseur cure By Soma

Curing and storing your sacred medicine is as important as getting your crop growing correctly. Its amazing the number of people out there growing cannabis who don't know how to cure their weed. If done correctly, your harvest can last a year or more and still taste superb.



Live NYC Diesel



Cured NYC Diesel

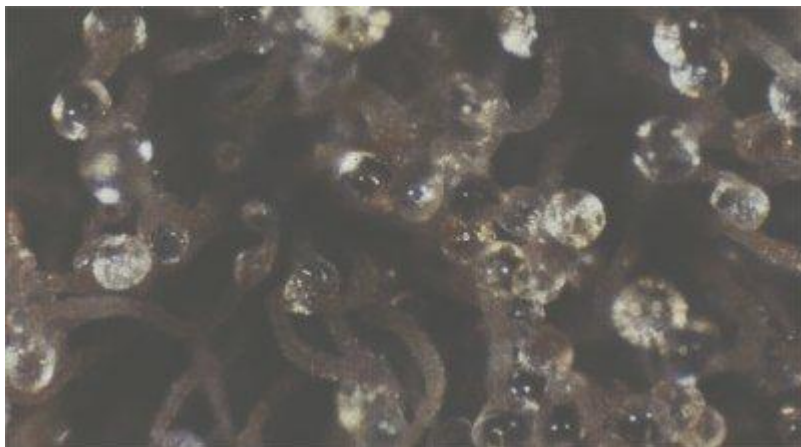
Having been around cannabis growers for many years now, I have seen some bad mistakes made in this department. The most common problem with harvesting and drying marijuana is that people pick it too early. They become impatient, have bills to pay, get paranoid, or run out of smoke. They go to their growroom, look at their plants, and justify picking them early. That is the first no-no in growing: Don't harvest early. My

motto is “When it looks like it’s ready, wait a week.”



The Purple, heavily resinated

Cannabis is ruined if it’s picked too early. Learn to observe your plants very closely, noticing exactly when the calyxes are so swollen with crystals that the plant will not get any ripier. Don’t just wait until the white pistils turn red. It’s not the red hairs that get you high; it’s the trichomes on the calyxes. A 30x microscope with a light will help you to see if the trichomes are almost halfway amber. That’s when I like to harvest, though some people pick before they turn color at all.



Trichomes just starting to turn amber

Sometimes you have to harvest early for reasons beyond your control. I was growing a beautiful crop here in Amsterdam when I found out my landlord was selling the property. I had to move out and pick it two-and-a-half weeks early. Waiting until the last possible moment, I then organized a team of good friends to help. With three days left before I had to be completely out of the space, I cut the plants down and hung them in the growroom with a charcoal filter.



Buds must line-dry before hands can go to work.

I let them dry for two days, then put them in sealing bags to stop the smell and quickly brought them to my new space. There I took them out of the bags (sealing bags and a sealing machine are essential tools of the trade), hung them up in a cool, dry space, and let them dry for another 10 days. My friends and I completely dismantled the growroom, making it look like it never existed. I and the crop were history. This particular crop wasn't up to snuff—but I figure life is what happens in between plans, anyway.

When you are down to your last two weeks of flowering, you should begin to think of where you are going to dry your smelly harvest. Many a garden has been lost due to the stinky smell wafting out in the wrong direction. I suggest a charcoal exhaust filter in the space where the cannabis will dry—better to be safe than, sorry. Depending on the quantity you are working with, you will want to hang several strong lines going from one wall to the opposite wall in the room with the filter. A good-quality circulating fan is needed to move the air around the room, to gently help the moisture evaporate off the plants. What you want is for the moisture to evaporate at a slow rate; you do not want the plants to dry quickly.

I use a sharp gardener's pruning shears to cut the plant. I then take all the large fan leaves off, using my thumbnail (and the thumbnails of my friends). I take no more off the plants. The sacred medicine is then hung upside down from the strong crooks on the plant. When the herb is hung in this way, the buds form into a nice teardrop shape. The temperature in the room is about 65°—75°F, so it stays dry, but not too dry. I give the room seven days and check a bud to see if the stem snaps. If I think it's getting close, I start manicuring. If it's not dry enough, I wait.



Love for the plant keeps you going.

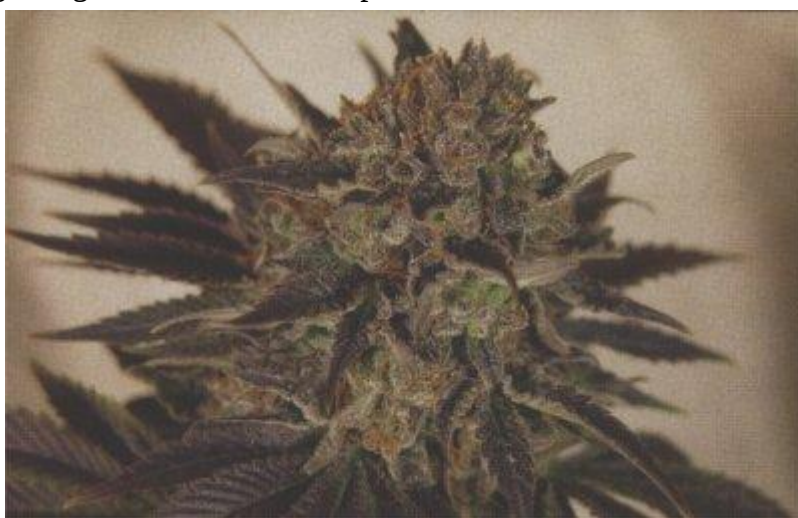
The next item you need is a large table with a clean, shiny surface. With it, you need a few pairs of sharp scissors and some good lighting. I then take a T-55 silk screen that's slightly smaller than the table and attach it with duct tape. The tape stops it from moving. The purpose of the silk screen is to catch the large resin glands that are heavy and fall off first. If the quantity is large enough, I have a friend sit on each side of the table, at his or her own station, so to speak.



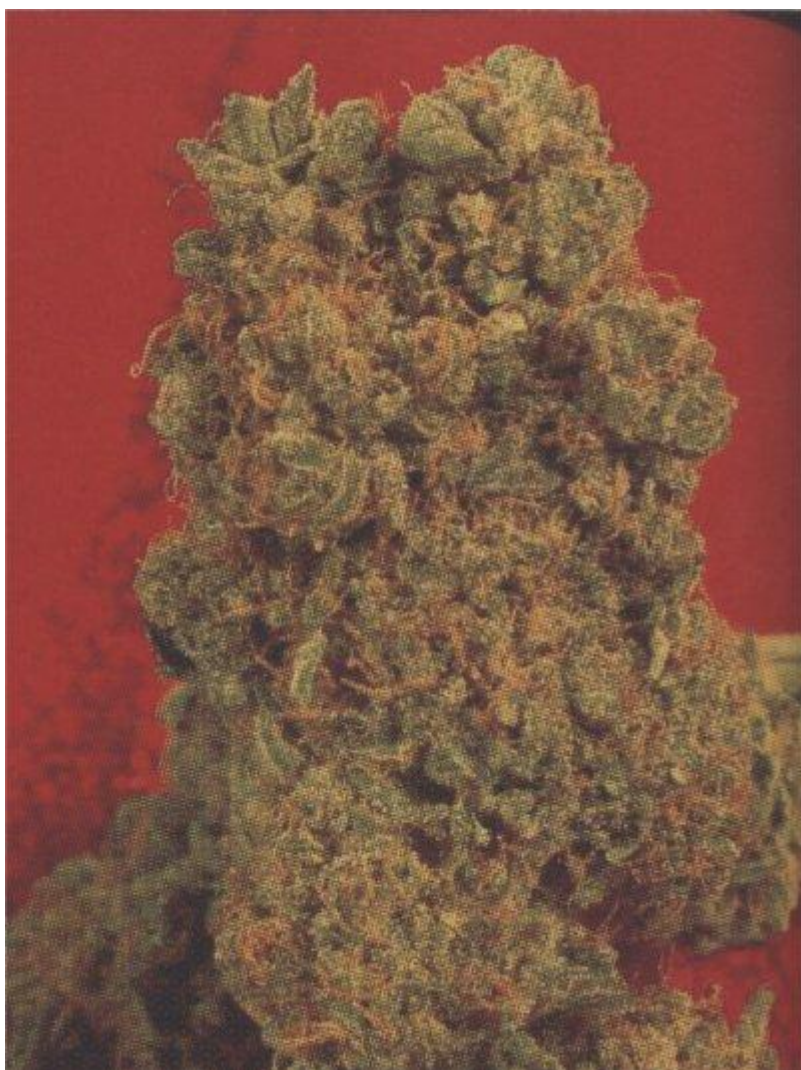
This work must be done right.

With scissors in hand, we start clipping the small branches off the main trunk of the plant and lay them on the screen. Pleasant music and some fine smoke are essential here, because you need to have a good buzz to sit there for a few hours. My manicuring team and I then start to take all of the extra leaves off the buds. We use our fingers to take the leaves off and use the scissors to cut the stems. After a while, sticky, smelly resin starts to stick to our fingers. and every couple of plants we have to rub it off into a bowl. This hash is priceless: no one ever sells it. The only way to get it is to grow it.

When the buds are cleaned of all leaf, they are placed on screens and allowed to dry a little bit more. All the leaf trim is saved to make water hash. After the cleaned buds have sat out on the screen for a few hours, they are ready to be placed in Mason jars. I leave them closed overnight and then open them again for an hour. This process helps the moisture trapped inside the stem to rehydrate the drier leaves on the outside of the bud, giving a homogeneous dry to the plants. I keep opening the jars and checking them for about a week. It is imperative that your stems snap before you put your herb away for any length of time. If they don't snap and you put it away, your stash will go sour, ruining the perfume of the sacred herb. Marijuana changes with time. If you smoke it as soon as it is dried, you can really taste the chlorophyll. In a month, it tastes better, and in a year, it gets a golden color and a deep, rich smell.



Live Rockbud



Cured Rockbud

If you treat your harvest in this way, you can have your own connoisseur's stash to smoke all year long. I for one don't like to smoke buds that aren't at least 3 months old, as time has a gentle way of making the chlorophyll taste fade away. Once you have it just right, it can be placed in a freezer for very long-term storage and will be good literally years from now.

Trichome Talk

Interview by Chris Simunek

Trichome Technologies is a research partnership started back in '94 by experienced cannabis cultivators K and Sharky. They have invested significant amounts of time, energy, and money in laboratory-grade facilities, where they dedicate themselves to the research, development, and stabilization of medicinal and commercial-grade cannabis. K has been studying our favorite molecule for some time now. We decided to ask him a few questions regarding the magnifying-glass method for determining the peak ripeness of cannabis plants.

HT: How many days after flowering do you usually harvest?

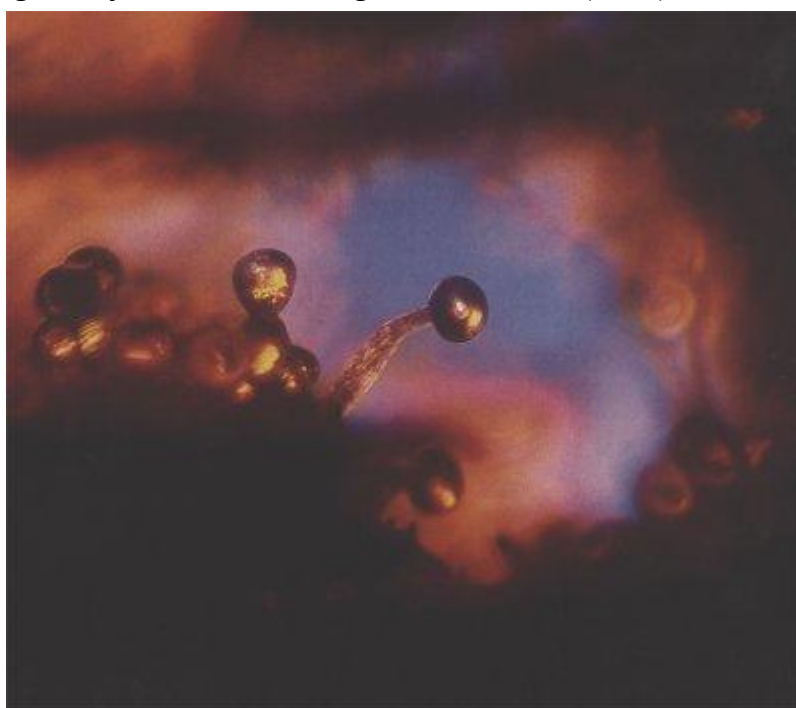
K: We usually harvest after about 60 days. Sativa-indica hybrids will take up to 75 days. I work with strains that are pretty close to each other and peak right at the same time. Basically I look for the fullness of the trichome. I make sure the head of the trichome hasn't changed color.

You use a loupe?

It's hard getting a grow specimen between the lenses of a microscope, so yes, we use a 20x loupe, or a 100x if we have one.

What do you look for?

A capitate-stalked glandular trichome looks like a mushroom under a microscope or loupe. There are other trichomes, but that's the one that holds most of your THC. I'm looking for a fully developed mushroom head that is clear, just starting to turn opaque - certainly not turning amber, which is a sign that your THC is turning into cannabinol (CBN).



Trichomes magnified at 150x

We harvest when 60% of the trichomes are ripe and 40% are just starting to get ripe. Once everything is properly dried, cured, and stored, those trichomes that weren't fully ripened should pretty much be at their peak.

So you don't judge by the color of the pistils?

No, not really. There is a general rule that as long as 60% of your pistils have started to dry up, turn brown, purple, or whatever, they're ready. Using a loupe is just more exact, because the plant will still produce more pistils throughout its life. Counting the brown hairs on your plant is a small indicator, but it's far from your total indicator. With a loupe, you can watch the total development of the trichome, from its incarnation to its finish.

What happens if you leave them too long?

If we didn't pick at that point, we would go past peak, the mushroom head would explode, and at the end of the process, we would have too high a percentage of overripe glands. The THC would have converted itself into other cannabinoids, such as CBN and cannabidiol (CBD). Trichomes basically just shrink and evaporate. All your terpenoids evaporate, and your drug evaporates also. Sometimes they just fall off. So you don't want to go past peak, and you don't want to go early.

Are there any high-tech methods of determining ripeness?

In a laboratory situation, you could pick a small specimen from each strain and run it through a gas chromatograph, and determine exact THC levels from day to day until the THC peaks. I've heard you can rent a machine for \$1,500 a month. The problem is that you must provide a standard, a sample that has already been lab-tested and proven to contain a guaranteed percentage of THC. You can only obtain these specimens from the University of Mississippi and/or EISOHly Laboratories Inc. Unfortunately, these standards are heavily controlled by the DEA.

